DÆDALUS

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CURRENT WORK AND CONTROVERSIES—2

William Dray
Paul Friedrich
Edward Grant
David Hawkins
Richard Hofstadter
G. A. Kursanov
Seymour Slive
William P. Travis
Morton White
and others

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EDITORIAL OFFICE: *Dædalus*, the Journal of the American Academy of Arts and Sciences, 38 Kirkland Street, Harvard University, Cambridge 38, Massachusetts. All communications to the Editor should be sent to that address.

SUBSCRIPTION OFFICE: American Academy of Arts and Sciences, 280 Newton Street, Brookline Station, Boston 46, Massachusetts.

SUBSCRIPTIONS: *Dædalus* is published quarterly. Subscription rate in the United States, $5.50 a year; foreign $6.00; single copies (regular current issues), $1.50 domestic, $1.75 foreign; for a back issue, add $0.25. Subscription orders should be sent to the Subscription Office.

Published by the American Academy of Arts and Sciences

Printed in the United States of America

Library of Congress Catalog Card Number: 12-30299

Second-class postage paid at Richmond, Virginia

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DÆDALUS

Journal of the American Academy of Arts and Sciences

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SUMMER 1962

ISSUED AS VOL. 91, NO. 3, OF THE PROCEEDINGS OF
THE AMERICAN ACADEMY OF ARTS AND SCIENCES

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Preface to the Issue

"Current Work and Controversies"—2

Dædalus HAS become known in the last five years for its distinctive format, which permits a close examination of a single theme in each issue. The Editors intend to continue with this device, believing that it serves a purpose not performed by other scholarly journals. Occasionally, however, as with the present issue, we plan to publish papers on a wide variety of subjects. Once before, in the summer of 1959, we published such an issue, calling it "Current Work and Controversies." The title is so descriptive that we now use it again. It expresses the three ambitions of the issue: to acquaint the reader with new forms of scholarship characteristic of various established disciplines; to suggest reinterpretations that contemporary scholars are making of subjects on which there is already an abundant literature; and to emphasize the scholar's continuing commitment to an analysis of questions having a large and immediate public relevance. Each of the articles that follows serves one or several of these purposes.

Morton White in his "Reflections on Anti-Intellectualism" writes about a subject that has received increasing attention in recent years, but rarely in the way that is suggested here. The discussion by Seymour Slive of symbolism in seventeenth-century Dutch painting raises questions as to why we often see only certain aspects of the artist's intention in his work, and how scholarship serves to make us aware of others. Richard Hofstadter's "The Child and the World" is an inquiry into the intellectual and social roots of John Dewey's educational philosophy. William P. Travis has taken issue with some of the most widely held views about the consequences likely to be realized by tariff reductions along the lines proposed by the Trade Expansion Act (1962). Since this paper will almost certainly raise controversy, it is hoped that *Dædalus* may publish an answer

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to it in a future issue. The linguistic problem for a multilingual state like India and its political and educational implications are discussed by Paul Friedrich. David Hawkins' "Design for a Mind" is an example of scholarly inquiry which might have been attempted in the nineteenth century (or even earlier), but which derives its particular urgency from technological possibilities of more recent date. Mr. Hawkins writes about "machines that think." William Dray's inquiry into explanations of the origins of the American Civil War suggests what the philosopher of history is able to contribute on a topic that has never lacked attention from historians. "Hypotheses in Late Medieval and Early Modern Science" is Edward Grant's contribution to a subject which could not be studied until the expression "medieval science" was seen as something other than a contradiction in terms. We are reminded that this perception did not come till the beginning of the present century. Finally, we print, as a document, a Soviet interpretation of Philipp Frank's *Philosophy of Science.* The significance of this essay will be apparent from the first sentence, and speaks for itself.

S. R. G.

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MORTON WHITE

Reflections on Anti-intellectualism

ONE OF THE MORE obvious features of the epithet "anti-intellectualist" is its ambiguity.* It may refer either to one who is hostile to intellectuals or to one who is hostile to the philosophical doctrine known as intellectualism. And so it would be just as well to begin with a terminological distinction that reflects these two different uses of the term. I shall call a person who is hostile to intellectuals an "anti-intellectual," dropping the superfluous suffix "-ist," except when referring to philosophers like Bergson and William James, who are critical of certain views concerning the intellect.

The anti-intellectual is usually an ordinary man, a *non*-intellectual, to whom an egg-head is an egg-head, whether scientist, historian or philosopher, rationalist or empiricist, hard-boiled or scrambled. For the anti-intellectual, the important contrast is that between the pursuits of the professor, artist, scholar, and scientist, on the one hand, and those of the business man, plumber, secretary, barber, and politician, on the other. But the salient contrast for the anti-intellectualist is within that world which the ordinary man treats as the uniformly gray world of gray matter. Unlike the anti-intellectual, the anti-intellectualist may press the claims of the heart and the hand against those of the head, or he may think of intuition as a superior faculty to be distinguished sharply from that employed by the mathematician or the experimental scientist.

A Metaphor

Even though the category of anti-intellectuals may be distinguished from that of anti-intellectualists, the fact that both consist

* A considerably revised version of a lecture delivered in 1960 at Marietta College on the occasion of the one-hundredth anniversary of its Phi Beta Kappa chapter.

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of individuals who are opposed to something makes it possible to distinguish analogous subclasses within each of the categories. This may be done by distinguishing different ways in which one may oppose something, and an easy way to do so is to employ a metaphor in which we think of the anti-intellectuals and the anti-intellectualists as conducting a war, or some kind of game, if that is pleasanter to contemplate. Then, if we imagine the anti-intellectuals arrayed against the intellectuals, and the anti-intellectualists against the intellectualists, we may distinguish three kinds of strategies that may be employed in each case.

Let us begin with the campaign of the anti-intellectuals. One of their strategies calls for the total destruction of the enemy; a second calls for his containment; and a third calls for an invasion of his terrain. The destructive critic of the intellectual cannot understand how anyone could possibly follow such trivial, silly, time-wasting pursuits, and would therefore liberate society from the responsibility of supporting such drones. Containment is the slogan of the peasant who resents the philosopher's telling him how to run his affairs, and it can portend nothing more painful than a request that the philosopher mind his own business. The invaders wish to enter the classroom, the study, the studio, or the laboratory, and dictate what shall be done and how. The policy of destruction, if pushed to its logical conclusion, would eliminate schools, colleges, universities, sciences, and the arts. Containment would permit intellectuals to operate, but only if they are properly fenced in or reined in, limited in their influence and allowed to express nothing more than idle curiosity—and the idler the curiosity, the better. The invaders would move in on the intellectual and force him to improve himself by standards provided by the invader.

The vertices of this triangle of destruction, containment, and invasion represent what Max Weber might have called three ideal types of the popular anti-intellectual. They are conspicuous points toward which the anti-intellectual can gravitate. Of these three, the point of destruction is the least popular in the world today. Most popular is the wish to contain, which springs from resentment at the sight of the professor moving into politics, the scientist making government policy, the doctor advocating birth control, the Keynesian economist seducing the sons of businessmen. Although the desire to invade the intellectual's sanctuary would seem to occupy a middle position in terms of popularity today, it must always be reckoned as the more dangerous of the two more popular threats

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to the intellectual life, and for this reason I shall be primarily concerned with it in this essay.

If one turns to the anti-intellectualists, one may once again speak profitably of a triangle of destruction, containment, and invasion; and once again it is fair to say that the destructive attitude figures least prominently. Here too the most influential strategies seem to be those of containment and invasion. But here the significance of containment and invasion is different from what it is in the case of the anti-intellectual's war, precisely because the anti-intellectual and the anti-intellectualist aim at different opponents.

Since containment and invasion are the more common strategies among anti-intellectuals and anti-intellectualists, it will be useful to say a few words about them in both their forms, particularly the latter. First, containment. We try to contain, restrict, or limit what is, or what seems to be, pushing too far, pressing us too hard, invading our own territory. And we try to restrict it rather than destroy it, either when we find it too powerful to destroy, or when we think it will do a useful job if it minds its own business, not ours. Hence it is the *aggressive* intellectual whom the anti-intellectual wants to contain and the *aggressive* intellectualist whom the anti-intellectualist hopes to restrict. When a society has respect for its intellectuals, it will not wish to destroy them. But if the intellectuals begin to threaten the ordinary man, the ordinary man will seek to draw a line beyond which he will not let the intellectuals move. If the ordinary man continues to admire intellectuals, he will merely try to restrict their movements, to set up a wall between the intellectuals and the territories really or seemingly threatened by them.

Something similar may be said about the anti-intellectualist's attitude toward reason. So long as the philosophical analyst of reason is willing to accept or encourage a limitation on its sphere of influence, he does not incur the enmity of the philosopher who is willing to see reason operating peacefully in its own sphere. But let the intellectualist move too far into forbidden territory, and he will meet the blocking efforts of the restrictive anti-intellectualist.

A Little History

The history of modern philosophy yields striking confirmation of this thesis. When the intellectualist limits the sphere of the intellect to pure mathematics and logic, when he says that only truths in these domains may be established by the workings of abstract

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intellect, he threatens relatively few philosophers. Pure reason is surely the custodian of pure questions and pure answers. But let the intellectualist be aggressive, as he was in the seventeenth century, and he will have to answer to the empiricist, who is a comparatively mild sort of anti-intellectualist.

The empiricist like Hume wished to prevent the extreme intellectualist, the Continental rationalist, from invading a territory which he, the empiricist, thought of as the preserve of sensory observation and experiment. The rationalist had claimed, or seemed to claim, that pure reason could solve problems that properly belonged to the realm of experience, and therefore he was checked by the empirical anti-intellectualist, who insisted that we must look, listen, taste, touch, and smell in order to confirm or test statements about the world. To be an anti-intellectualist in this case is to be nothing more than an empiricist who insists that there are truths that cannot be detected without recourse to sensory experience. These empirical truths the empiricist wished to protect from the arrogant incursions of the rationalist's reason, and so he tried to contain the rationalist. The result was a salutary containment of the intellect as conceived by the rationalists. Hume and his friends turned back the rationalist Turks at the very gates of empirical science, and the Turks have never made a serious effort to re-enter them.

Indeed, so effective were the empiricists in their effort to contain the intellectualists that the empiricists forced an entry into the land of the intellect. They forced a reconstruction of the idea of the intellect itself, and this, one might say, represented a turning of the tide. Once the empiricist's point was accepted, the intellect had to be conceived more broadly and more liberally. Pure mathematics could no longer be regarded as the sole example of rational intellectual activity. This empirical phase of anti-intellectualism, however, was only the beginning. Once the tide was turned, the real onslaught on intellectualism began. Now the empiricist had to face *his* critics. At this point in the history of Western thought, a much more aggressive variety of anti-intellectualism emerged. For even after the empiricists forced a broadening of the intellect, more extreme anti-intellectualists appeared, demanding greater concessions.

After observation and experiment had won their way into the house of truth, it was the turn of passion and practice. Their partisans were encouraged to think that they too could enter and

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take their places as reputable providers of knowledge. And this was the point at which the salutary invasion begun by the empiricists was pushed to an absurd extreme. Moreover, it was converted into a variety of anti-intellectual*ism* that could easily be used by the anti-intellectual. The appearance of the doctrine of passional truth encouraged a convergence of the anti-intellectualists and the anti-intellectuals, the two classes we distinguished earlier. They remained distinct in composition, but the aggressive wing of one class took courage from the aggressive wing of the other.

A Digression

Before I try to show how this came about, let me make clear that the extremely aggressive anti-intellectualist, the partisan of passional truth, argued for more than the *existence* of passion. It is one thing to say that there is such a thing as passion, and another to say that there is passional truth. It is one thing to say that we have hearts as well as heads; it is another to say with Pascal that the heart has reasons that the reason can never know. It is one thing to say that logical calculation and experiment are not the only activities worthy of man; it is another to say that there are truths which can be established by other methods. The difference in each case is the difference between a true announcement and one that represents a false and dangerous variety of anti-intellectualism. There is also a difference between calling attention to the *existence* of know-how and elevating it into a distinctive source of truth.

When philosophers call attention to native abilities and innate skills, they say something that should be acknowledged by anyone. There is a difference, as Aristotle knew, between knowing how to attract people and knowing that all bodies attract one another. There is a difference between knack and knowledge. To win friends is not to write a treatise on how to win friends. To be a sympathetic, understanding person is one thing; to be a psychologist is another. No intellectual and no intellectualist need fear these true propositions. Therefore, the reminder that there is such a thing as knowing how is really not a variety of *anti*-intellectualism. However, those who go further and insist that passion and know-how are avenues to truth *are* aggressive, invading anti-intellectualists. When Pascal spoke of the heart's reasons, Emerson of the heart's

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truths, and D. H. Lawrence of blood knowledge, they surely did not wish to insist merely on the fact that men have passions: they went further and urged that the passions yield a peculiar sort of truth and knowledge.

It is a tribute to the importance of knowledge and truth in the Western tradition that so many have thought that truth is the goal of poetry. The prestige of truth and knowledge have been so great that some poets (or their spokesmen) seem compelled to prove to the world that the poet also discovers theorems. Plato banished the poet from his ideal community, presumably for not being truthful enough; but the reply to Plato should have been that he was blind and narrow-minded, unable to see that a civilized man could not live on dialectic alone. Instead, unfortunately, certain self-appointed counsellors of poetry felt compelled to get their clients back into the Republic by ill-advised appeals to the doctrine of poetic truth.

Now the poet should be granted liberty, and even license, but I see no need for providing him with a disguise too. The greatest poets have provided us with truths about man and the world that we might never have known before, but when we accept these truths, we do so because we can in some sense confirm them by means that are not peculiar to poetry. Poets may help us see the truth, but they do not have special methods for confirming it. Moreover, it is grotesque to suppose that the worth of poetry is directly proportional to the amount of truth it uncovers, a conclusion to which some partisans of poetic truth seem to be driven in their laudable but badly reasoned efforts to squeeze the poet into college departments of literature. He deserves to be there, but not because he allegedly reports on ethereal things. The danger of this kind of doctrine is even greater when passion, poetry, and practice are said to be sources of *higher* truth, of knowledge which is real and great by comparison to the arid pedantic knowledge gained by calculation and experience. This is the most aggressive form of aggressive anti-intellectualism, for it not only tries to get the poet into a club he would be wise to stay out of, it tries to make him president.

To deny that the poet is primarily concerned with establishing truth by a peculiar method of his own is not to denigrate poetry. On the contrary, the effort of the poet's lawyer to demonstrate that poets are primarily searchers after truth is less than a tribute to one of the noblest activities of man, for it is a misleading way of getting the poet his proper due. There is a difference between be-

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ing a poet and being a nuclear physicist, one which is not brought out properly by saying that they seek different kinds of truth, each in his own way. A similar point may be made, even more forcibly, about the claim that passion can lead to truth. The passions may form the *subject matter* of a truthful study, they may stimulate such a study, and they must often be consulted when one is making a moral decision, but it is disastrously misleading to postulate a kind of truth which passion itself finds according to its own infrared lights.

A Spectrum of Philosophies

To see how an anti-intellectualistic doctrine like that of passional truth can encourage the anti-intellectual, one must realize that it represents an aggressive variety of anti-intellectualism which is primarily populistic in character. That is why it is admirably suited to encouraging an aggressive attack on the intellectual.

If we begin with the plausible assumption that there are no more than two ways of arriving at reliable knowledge of truth, namely, logic and empirical observation, we may think of the history of philosophy as a story of misguided efforts to present others. These efforts divide into two categories. Philosophers of an aprioristic turn of mind have often spoken of a metaphysical capacity to intuit truth, one that allegedly surpasses the kind of reflection that yields ordinary logical or mathematical truth. Such philosophers occupy a position which is at the opposite extreme from that held by partisans of passional truth. One may imagine a spectrum of faculties, proceeding from the metaphysical intuition celebrated by the superrationalist, through calculation and empirical observation, which are favored by the chastened intellectualist, and on to the subempirical methods of practical skill and feeling. At one extreme we have the superrational faculties of man and at the other his subempirical gropings and impulses. Intuition as here conceived is the faculty to which the ancients, some of the medievals, some of the classical rationalists, and possibly Kant, appealed. It is a form of superscientific mental activity under which one might include the discovery of innate principles and self-evident propositions as conceived by some philosophers. Philosophers who have urged the existence of such faculties have sometimes thought of them as supermathematical, while philosophers who have moved away from logic and sensory experience in the other

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direction have insisted on the subsensory capacity of some men to *feel* the truth with their hearts and their hands. Therefore, a spectrum of philosophies may be defined in terms of this spectrum of capacities. In the ultra-violet region we find the superrationalistic doctrine that metaphysical intuition yields knowledge; in the infrared region we find the subempiricist view that skill and feeling yield knowledge. In the visible region we find a sensible variety of intellectualism, according to which reason and experience are the only avenues to knowledge.

A Convergence

I am now in a position to describe the convergence of the anti-intellectual and the anti-intellectualist. Although I am keenly aware of the problems that arise when one tries to associate philosophical doctrines with sociopolitical attitudes, I wish to put forth a hypothesis which is suggested by reflection on the above spectrum of philosophies. First of all, I should like to express agreement with the familiar thesis that those philosophers who urged the existence of supermathematical insight spoke for, or prepared an ideological weapon for, the few. To urge that there is a mode of insight into truth which transcends that of even the mathematician is to call attention to a putative capacity which only the most favored few possess—the priests, metaphysicians, theologians, and sages. And therefore, *other things being equal,* this is a conservative or aristocratic form of anti-intellectualism. Locke correctly viewed it in this way when he criticized the doctrine of innate principles and attacked the men it would set up as "dictators of principles." John Stuart Mill was properly suspicious of the intuitionism of the Scottish school on similar grounds.

By contrast, I should like to emphasize that the romantic anti-intellectualism which celebrates the powers of the farmer, the artisan, and the red-blooded man is, other things being equal, a democratic form of anti-intellectualism. The point is that, as one moves along our spectrum from metaphysical intuition to pure feeling, one is moving from faculties which (in the Western tradition at least) are thought to be possessed by very few, to those that everyone has. It is primarily for this reason that the superrationalistic critics of calculation and experience, who complain that they are not the only sources of truth, have been aristocratic in tendency; whereas those subempiricists who urge the claims of

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passion and know-how have been, generally speaking, democratic or populistic in tendency.

Moreover, it would appear that superrationalism is more typical of a prescientific age, whereas, of course, the subempirical variety of anti-intellectualism first flourishes after the eighteenth century. It is mainly a product of the romantic era, when the passions, the emotions, and the feelings came to be regarded as ways of reaching truth and knowledge. This variety of anti-intellectualism is primarily a reaction to, rather than a precursor of, the scientifically oriented intellectualism of the eighteenth century.

American Anti-intellectualism

Because of my special interest in the history of American ideas, I wish to apply what I have said to two key figures in the history of American philosophy, Emerson and William James. American philosophy, as represented by Emerson in the early nineteenth century, was romantically and democratically anti-intellectualistic. In a new country that lacked a feudal tradition, that was filled with a vast wilderness, that celebrated the yeoman's life, that suspected the dialectical minutiae of technical philosophy, one might expect that romantic and populistic anti-intellectualism would flourish. Emerson's thought was permeated by a conviction that the mind has ways of knowing which go beyond calculation, observation, and experiment. His distinction between Reason and Understanding led him to think that the Understanding was the limited faculty celebrated by the empiricists, a faculty which he identified with science, which was unsatisfactory, he thought, because it did not transcend logic and experience. By contrast, Reason, as Emerson conceived it, went deeply into the mystery of things, and its truths, he thought, were perceived by the poet more readily than by anyone else. It should be realized, therefore, that Reason as conceived by Emerson was very different from Reason as conceived by Descartes and the classical rationalists. Emerson did not think of it as the instrument of supermathematicians but rather as the tool of subempiricists. It was the way of the heart, and the heart led man into a realm which could not be penetrated by abstract reason.

In Emerson's case the claims of the poet were associated not only with an effort to limit the sway of the scientific intellect, but also with a romantic love of Nature and a distaste for the city of

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his time. The Understanding, empirical science, the city—all these were artificial and hence to be put lower than Reason, poetry, and the country in his scheme of values. He scorned logical consistency. And like so many of the romantics he thought of the heart as a faculty which was more commonly used by the man of the soil than by the sophisticated urban intellectual. He said that poetry brought us closer to vital truth than history. Moreover, Emerson constantly sang the praise of artisans. Although he found himself drawn to rural life, he did not despise practicality. Like Crèvecoeur, he associated rural life with practice as well as with feeling. Both practice and feeling were contrasted by Emerson with supersophistication and hyperintellectuality. This was a feature of his philosophy that attracted William James.

William James was a grandchild if not a child of the romantic movement. His famous essay, "The Will to Believe," was an effort to justify faith as a policy. It was written in opposition to scientifically oriented agnostics like W. K. Clifford, who held that, whenever we have no evidence in favor of a proposition or its contradictory, we must suspend judgment. Yet James thought that we are sometimes justified in accepting a belief even when, as he said, our "logical intellect is not coerced." He sympathetically quoted Pascal's statement about the heart's reasons, and toward the end of his life James enthusiastically saluted Bergson's crusade against intellectualism. The main point of James's "The Will to Believe" is its effort to describe a way of justifying beliefs which transcends logic and experience, a way which appeals to our feelings.

As James's thought developed, this emphasis on feeling as an integral component of the process of inquiry came to assume a greater importance. In his later *Pragmatism* he made *all* thinking subservient to the satisfaction of the believer, to the successful carrying out of his affairs—his business, in the widest sense. Even the scientific intellect, he says in his later writing, is properly coerced, validly affected by considerations which transcend calculation and experience as traditionally conceived. To be true is to work satisfactorily, to give satisfaction, to facilitate action, and this applies to scientific as well as to nonscientific belief. One is therefore tempted to say that in the early nineteenth century Emerson spoke primarily for rural man's feelings, while later on James was trying to forge a philosophy for pragmatic urban America. The one is primarily the romantic philosopher of passion, whereas the other is primarily the philosopher of practicality. Both speak up passion-

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ately for democracy and both are severe critics of formalism and hyperintellectuality.

Emerson and James are romantic populists among anti-intellectualists, and for this reason they are not only the most popular American philosophers but also they afford confirmation of the thesis that the invading anti-intellectualist can often supply aid and comfort to the invading anti-intellectual. I do not wish to say that Emerson and James themselves were anti-intellectuals. Nothing could be further from the truth. But I believe that their view that the passions constitute an *avenue* to truth can easily encourage the philistine anti-intellectual to suppose that he possesses capacities for arriving at *knowledge* that are superior to those of the scientist and the scholar. This in turn emboldens the anti-intellectual to think that he can tell the intellectual how to run his business. This is the link that joins the two classes of individuals distinguished on the first page of this essay.

In America, therefore, the aggressive anti-intellectual has not been coached or encouraged primarily by superrationalistic, aristocratic theoreticians, but rather by romantically oriented populists. Emerson's campaign against the Understanding was conducted in the name of the "whole man," as he called him, and the whole man has often been identified by the ordinary man with himself. While reading Emerson, the ordinary man may easily conclude that "vital truth" can be arrived at by the use of faculties which he, the ordinary man, has, and has in much greater degree than the pedantic, narrow, pale, anemic, clever scientist or philosopher. All people have hearts and know-how, though not all of them have very high I. Q.'s. They all have emotions and passions and it is commonly thought that the farmer and the man in the street have more and deeper passions than the dust-ridden scholar in his library. So, when ordinary men are encouraged by anti-intellectualists to think that passion and know-how are superior roads to *truth*, they feel more confident that they are as good or better *at the intellectual's game* than the intellectual himself.

A Moral

Populistic anti-intellectualists have encouraged anti-intellectuals by sponsoring a misconception of the nature of knowledge which has had serious effects on our educational system and on our position in the world. It is implicitly shared by those who speak of

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feeling as not merely the subject matter of knowledge, but also as one of its sources. It is at the root of misguided efforts to fill the college curriculum with vocational courses, and courses in the creative arts. When it is coupled with a certain view of spiritual truth, it can lead to a statement like the following by the Governor of the State of New York: "Knowledge is of value only in so far as it is in accord with the spiritual truths inherent in our Judaeo-Christian tradition" (*The New York Times,* 5 December 1959).

In denying that feeling and skill are *sources* of knowledge, or avenues to it, on a par with reflection and observation, one does not deny the existence of feeling and skill. But we must realize that there is a difference between the pursuit of knowledge, on the one hand, and the cultivation of moral feeling, religious feeling, and artistic creativity, on the other. If we wish to cultivate feeling or creativity in the arts, let us not confuse ourselves with double, indeed, *n*-tuple, talk about many kinds of truth and many meanings of *veritas* in order to provide a reason for doing so in universities primarily dedicated to the pursuit of truth and knowledge. We demean the very things we wish to encourage when we try to justify them by the use of transparent casuistry. So long as the scholar or the scientist does not deny either the existence of non-cognitive capacities or the importance of cultivating them, he does not sink into a philistinism which is the reverse of aggressive anti-intellectualism. He merely insists on a distinction of profound human importance. In doing so, the intellectual does not set himself up as a priest or a prophet. But he does remind the anti-intellectual and his philosophical adviser that there are many subjects on which the voice of the people is not the voice of God.

Those who cannot see this today fail to see it at their own peril as well as ours. Today, when the territory of the intellectual is invaded either by anti-intellectuals or subverted by misguided anti-intellectualists, we all run greater risks than ever before. Today, the recognition that knowledge of the truth cannot be attained by mere feeling or instinctive skill is a necessary condition for the survival of those who are capable of that recognition as well as of those who are not.

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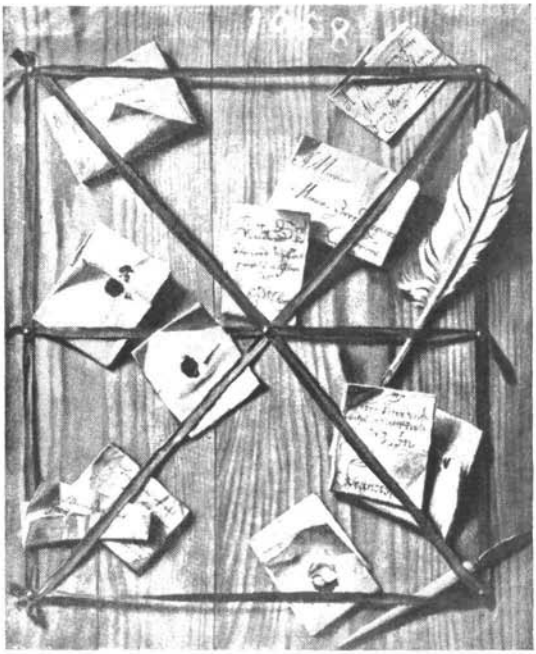

Figure 3.
WALLERANT VAILLANT,
Trompe l'Oeil: Letters, 1658.
Staatlichen Kunstsammlungen, Dresden.

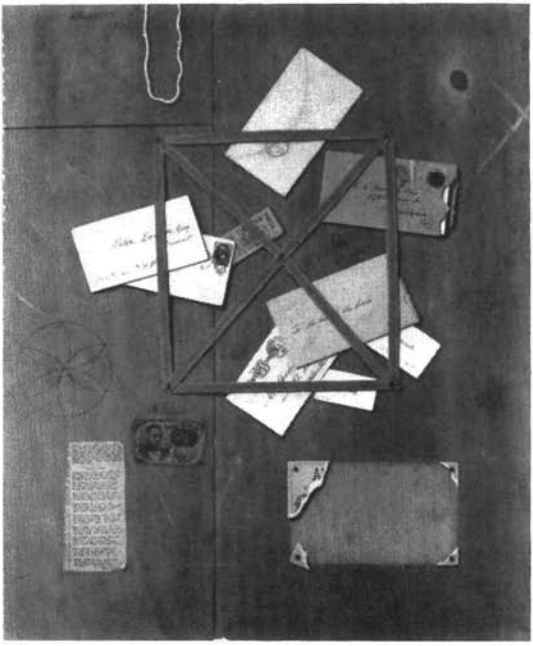

Figure 4.
WILLIAM HARNETT,
Trompe l'Oeil: Letters, 1879.
Formerly Mr. and Mrs. Arthur Hornblow, Jr., Coll., New York.

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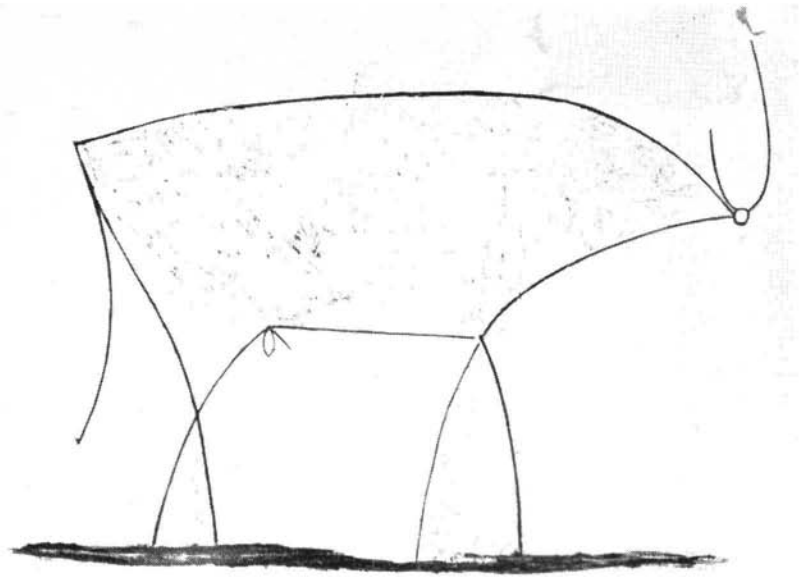

Figure 2. PABLO PICASSO, Bull, 1946.

that there can be aesthetic significance in pictures that have no subject in the traditional sense of the word. It is platitudinous to say that all painting is an abstraction. The most realistic painting is a transformation of the three-dimensional world into paint on a two-dimensional surface. Even in the effective *trompe l'oeil* by the Amsterdam painter Wallerant Vaillant, dated 1658 (Figure 3), the deception, if not a very profound or imaginative one, is carefully calculated. To convince us that his painting is part of the real world, Vaillant, like *trompe l'oeil* artists from the Italian Renaissance painter Jacopo di Barberi to the American William Harnett (Figure 4) minimized the space represented in his picture. Vaillant painted objects life-size in a very shallow space. The ribbons, the folded sheets of paper, and the pens are all kept parallel to the picture plane. When the corners of the pieces of paper project, they appear to come out toward us into our world, not into that of the picture.

The most literal attempt at transcribing the world into paint can never be purely passive and mechanical. No eye is virgin. Appearances rendered without the aid of conventions and schemes are always ambiguous. Distortions and adjustments must be made. The intensities of natural light cannot be reflected from paint with a

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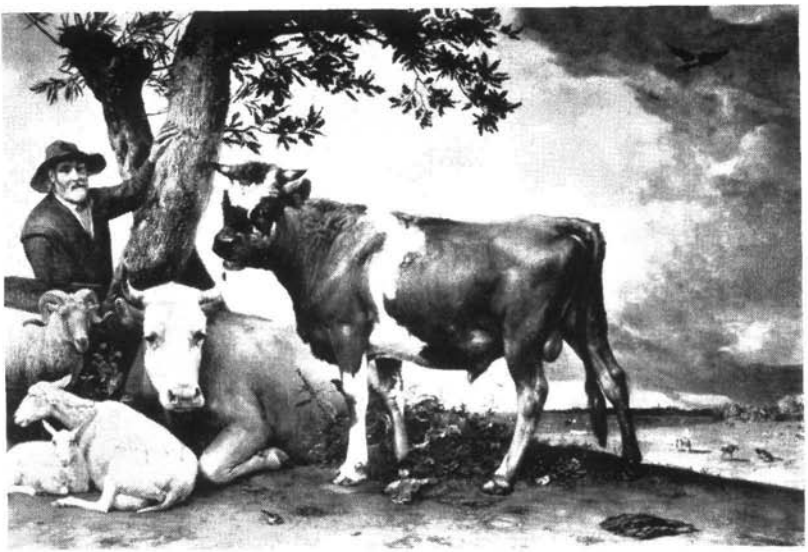

Figure 1. PAULUS POTTER, Young Bull, 1647.
Mauritshuis, The Hague.

lously painted one by Potter appear a bit boring. It is too realistic for our taste.

The charge of being "too realistic" is easier to lay than to demonstrate. The charge can also lead easily to a philosophic and semantic shambles. If we think of some of the different uses of the word realism—of realism as opposed to nominalism, or of realism as the antipode of idealism, of Courbet's realism, of social realism, magic realism, or of the real McCoy—it is easy to understand why Ortega y Gasset maintained that to say simply that an art is realistic is the most emphatic way of saying nothing. Nevertheless, it seems reasonable to call Potter and most seventeenth-century Dutch painters realists. If we must have a label, "realist" is a satisfactory one. Today, when it is no longer necessary to argue that the importance of a work of art qua work of art depends on the nobility or meanness of its subject, "realist" is no longer an opprobrious word.

We have accepted the idea that the formative energy of an artist can transform almost—not every, but almost every subject into a work of art. Everyone knows genre pictures, still-life paintings and landscapes which are superior to pictures of religious, allegorical, or historical subjects, and artists of our time have shown

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SEYMOUR SLIVE

Realism and Symbolism in Seventeenth-Century Dutch Painting

As long as man believed that painting worthy of serious consideration must depict noble subjects which instruct as well as delight, and that great artists are those who idealize man and nature, seventeenth-century Dutch painting was considered an inferior kind of art. Only when these notions were successfully challenged by nineteenth-century artists and critics was Dutch painting looked on as an important contribution to man's artistic heritage. It was then possible for a painting such as Paulus Potter's life-size painting of "The Young Bull" (Figure 1) to become one of the world's most famous and admired pictures.

Potter's "Young Bull" still has admirers. The director of the Mauritshuis, the museum at The Hague where the picture hangs, told me that an American cattleman offered to buy the painting from the gallery for one million dollars, and there is reason to believe that Premier Khrushchev, who is on record as favoring "the kind of art where you do not have to ask whether it is a cow or a horse," would also have high praise for it. More experienced gallery visitors are also struck by a certain power in Potter's picture. They are impressed by the original way the young bull, the farmer, and the trees have been silhouetted against the light sky, and by the wide expanse of landscape in the background. However, most of them are also familiar with the way artists of many different cultures and epochs depicted bulls. They know those from the prehistoric caves at Lascaux, the sacred bull on the wall of the Temple of Isis at Pompeii, and the impressive herd created by Picasso during his long career, from those that show the bull as a symbol of man's nature to the witty ones which belong to a series of eleven lithographs Picasso produced in 1945-1946 (Figure 2). Our familiarity with bulls, from paleolithic times to Picasso, make the meticu-

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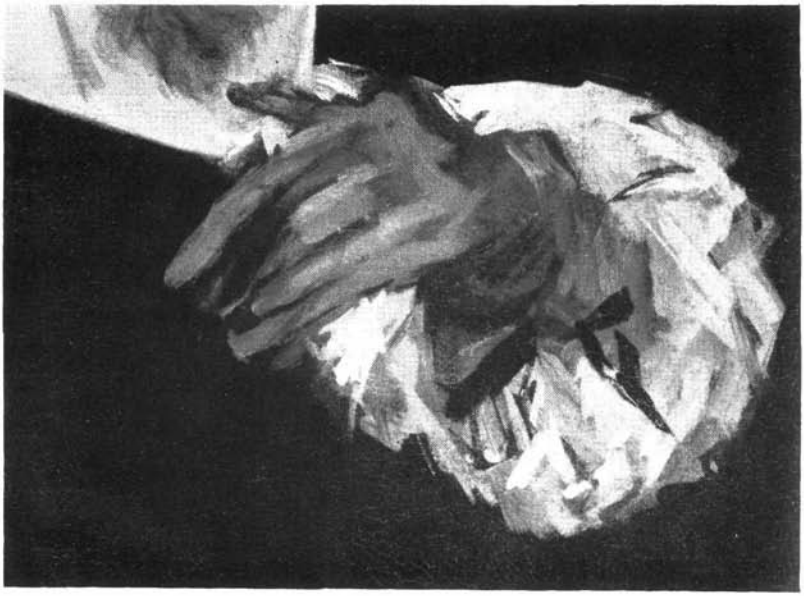

Figure 5. FRANS HALS, Governors of the Old Men's Almshouse, detail of a hand, 1664.
Frans Hals Museum, Haarlem.

comparable range. Vanishing point perspective, a system accepted since the Renaissance by Western artists and their patrons to create the illusion of space, assumes that we are a race of man-sized Cyclops with flat retinas. No matter. In art, as in love, men rarely object to being fooled.

Pleasure in the mimetic aspect of painting—*pace* Plato—is an ancient one. Pliny wrote about the grapes painted by Zeuxis which deceived birds, and of the curtain painted by Parrhasius which even fooled Zeuxis. Philostratus tells of a picture in which it was impossible to decide whether an actual bee had been deceived by a painting, or a painted bee deceived the onlooker. But delight in this kind of deception has been limited for modern audiences. We take our art seriously and do not want it to be confused with life.

We have been prejudiced against *trompe l'oeil* pictures by the efficiency of the camera and because some surrealists have exploited this mode of representation for cheap effects. There is another difficulty. If illusionistic painters want to be successful, they must make their brush strokes invisible. They must paint themselves out of their pictures. This presents an obstacle for many

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because of the contemporary bias against a high finish in painting. To be sure, not all pictures with a polished surface are found offensive. Van Eyck, Holbein, and Vermeer enjoy unchallenged reputations, and at least one hard-edge abstract painter is considered in many quarters as a likely candidate for election to our pantheon of artists. However, it is also true that our age, which has learned to see the merits of expressionistic painting, takes special delight in the wizardry of passages such as those in a late Frans Hals (Figure 5), in which no attempt has been made to hide the rapid touch of the brush, and the trained observer receives private pleasure trying to determine how a few slashes of yellow ocher, black, white, and venetian red have been used to suggest a glove, a cuff, and a sleeve. He also recognizes the artist's handwriting and likes to believe that he has begun to probe into the artist's personality—even into his soul.

Men of other ages found it easier to enjoy—or perhaps they were not as reluctant to confess that they enjoyed—being fooled by artists. Samuel Pepys recorded in his *Diary* in 1669 that a still-life painting of flowers by the Dutch artist Simon Verelst was "the finest thing, I think, I saw in my life." What fascinated Pepys in Verelst's still-life were "the drops of dew hanging on the leaves, so I was forced, again and again, to put my finger to it, to feel whether my eyes were deceived or no." Pepys noted that Verelst asked seventy pounds for his painting, and characteristically confessed that he "had the vanity to bid him £20; but a better picture I never saw in my whole life; and it is worth going twenty miles to see it."

Roger de Piles, the important French theorist of art and sensitive connoisseur of paintings and drawings, who has a much greater claim to distinction as a judge of pictures than Pepys, records that he too enjoyed *trompe l'oeil* pictures. In his *Cours de Peinture*, published in 1708, he wrote that Rembrandt painted the "Girl at a Window" (Figure 6) so that he could exhibit it at his own window and deceive the pedestrians. Rembrandt succeeded, de Piles adds, for "the deception was only noticed a few days later. It was not beautiful drawing, nor a noble expression which produced this effect. One does not look for these qualities in his work." Aside from the question whether Rembrandt's painting—or even the one by Rembrandt's pupil, Samuel van Hoogstraten, "Man at a Window" (Figure 7)—ever really deceived pedestrians, de Piles praised highly what he considered a *trompe l'oeil* by Rembrandt. And what is more important, he bought the picture.

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Figure 6.
REMBRANDT,
Girl at a Window, 1651.
National Museum, Stockholm.

Figure 7.
SAMUEL VAN HOOGSTRATEN,
Man at a Window, 1653.
Kunsthistorisches Museum, Vienna.

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One of the things de Piles must have liked about it was its bold execution, for he too had a bias against a *léchée* surface. In the *Cours de Peinture* he distinguished between two styles of painting (*le stile ferme et le stile poli*), and he stated that he preferred the bold style to the polished one. "Le stile ferme," he wrote, "donne de la vie à l'ouvrage et fait excuser les mauvais choix." He was critical of the masters of *Feinmalerei* who were so popular throughout Europe during his life time. The polished style, de Piles shrewdly observes, finishes everything and leaves nothing to the imagination of the beholder, who enjoys finding and finishing things which he attributes to the painter, whether or not they are really in the picture. Moreover, he said, unless the polished style is buttressed by a beautiful subject, it is flat and insipid.

De Piles exhibited Rembrandt's "Girl at a Window" in what he called "une place considerable" in his cabinet, not because it was a curiosity but because he thought it was painted well and with great strength. We also know that de Piles did not confuse Rembrandt's achievement with the illusionism of Hoogstraten or of other Dutch painters. Rembrandt, after all, was the only seventeenth-

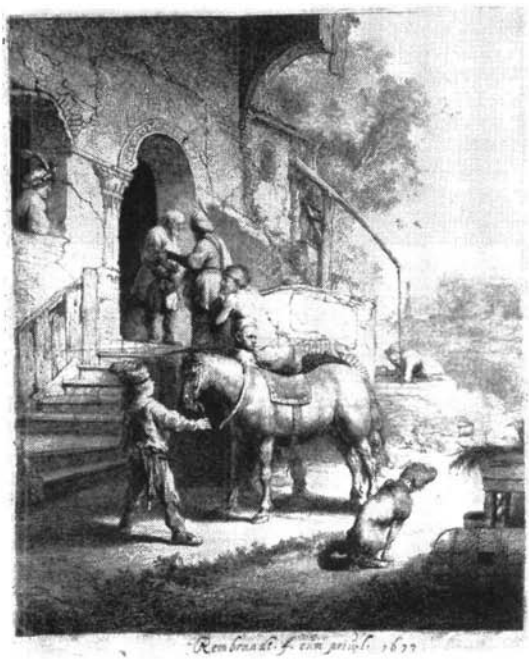

Figure 8. REMBRANDT, The Good Samaritan, 1633.

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century Dutch painter honored with a place in de Piles's famous *Balance de la Peinture*. But, in the final analysis, according to de Piles, Rembrandt could not rank with the very greatest.

De Piles and other seventeenth- and eighteenth-century theorists who maintained that painting should idealize man and generalize nature objected to the works by Rembrandt and other Dutch painters because they did not show knowledge of the ancients and did not know how to select the most beautiful from nature. They objected to Dutch painting because it was specific and familiar. The charge cannot be denied. Even the seventeenth-century Italianate Dutch painters who painted idealized landscapes paid more attention to the contemporary scene than did other foreigners who worked in Italy and found inspiration for their pictures in the Roman countryside.

Poussin and Claude peopled their classical landcapes with Biblical and historic personages and mythological heroes. Their younger Dutch contemporaries working in Rome, such as Jan Both, Jan Asselyn, and Karel Dujardin, used the Campagna as a setting for modern idylls. Dutch painters were called servile copyists of nature and accused of ignoring established canons of beauty and reason. Critics who believed that great art must handle noble and heroic subjects objected to Dutch pictures, which sometimes fail in decorum and even contain scatalogical passages. Rembrandt's early etching of the "Good Samaritan" (Figure 8) and a few others of his works quickly achieved the kind of notoriety which a later age bestowed on Molly's soliloquy in *Ulysses* and on parts of Henry Miller's *Tropic of Cancer*. This criticism is part of the perennial and complicated argument between the ideal and the actual which can be traced back to the philosophers of antiquity, who insisted that in literature man and nature should be depicted as they ought to be, not as they are. Social psychologists may one day help explain why some schools of critics have chastised artists, and even whole cultures, because they were more concerned with what they observed than with the norm, or with an abstract idea of beauty.

During the nineteenth century a group of critics took the opposite view about Dutch painting and insisted that it was worthy of special applause precisely because it paid little attention to idealized gods and heroes. The radical socialist Thoré-Bürger lauded the *égalité* of Dutch painting in the brilliant article he published in 1866, which resuscitated Vermeer. Thoré-Bürger wrote that in other schools there is a hierarchy. The Dutch school, he claimed,

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Figure 9. FRANS HALS, Banquet of the Officers of the St. Hadrian Militia Company of Haarlem, 1627.
Frans Hals Museum, Haarlem.

is a panarchy. In Holland each painter is a master, no matter what genre he chooses as his specialty: Brouwer and the Ostades, Both, Berchen and Dujardin, Paulus Potter, Dou, Cuyp and van der Neer, van Goyen and Wynants, de Heem and Hondecoeter, van der Heyden, Wouwerman, the van de Veldes, Ruisdael and Hobbema, Terborch and Metsu, Pieter de Hooch and Jan Steen and how many others, he said, are absolute masters, each according to his nature, even as Rembrandt and Frans Hals. The lion, the eagle, the butterfly, the dog, the violet, the ruby, and the emerald—all have equal rights in the universe, wrote Thoré-Bürger. From the seventeenth century up to Thoré-Bürger's time the majority of theorists and critics would have neither conceived nor accepted such democratic notions about painting. They implicitly or explicitly accepted a hierarchy of the kinds of painting when they endorsed the dogma that painting must instruct as well as please. The corollary of this proposition is that the finest subjects artists can represent are religious and historical themes. Next in the hierarchy came portraits, then landscapes, and still-life pictures ranked lowest.

In our day this hierarchy has been reversed. Indeed, an impressive number of contemporary artists and critics argue that

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Figure 10. YALE UNIVERSITY BASKETBALL TEAM, "Best in 51 Years," 1947.

pictures without recognizable subjects are the only important ones which can be painted today, and most artists who have not accepted this position are more at home with still-life themes and landscapes than with the subjects earlier critics called elevated. And so are the rest of us. How many can recognize more than a handful of religious and mythological motifs without consulting reference books? Only our trained theologians and iconographers are as familiar with the Bible as Renaissance and Baroque men were, and it seems that, with the notable exceptions of Aphrodite and Bacchus, the ancient gods and heroes were retired to an Olympian limbo about a century ago.

Vague knowledge of the subjects used by a Piero della Francesca or a Poussin seldom interfere with our appreciation of their artistic form. It is as easy as it is unhistorical for us to approach Piero as a quattrocento Seurat, or Poussin as a seventeenth-century Cézanne. With seventeenth-century Dutch painting it is different. Everyone recognizes the subjects depicted by seventeenth-century Dutch artists—or at any rate, most of us have been led to believe that we do—but more of that presently. We are put off guard by their straightforward or anecdotal aspects. Unfamiliar episodes from the

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Apocrypha or Ovid can be looked on with the same kind of detached wonderment most of us bring to the subjects portrayed by ancient Egyptian artists. The realistic subject matter used by seventeenth-century Dutch painters is different. It all looks so familiar. This familiarity has become as much of a stumbling block for critics today as the alleged mean and ignoble character of Dutch painting was for classicist critics of earlier epochs.

Nineteenth-century enthusiasts of Dutch painting praised it precisely because it reproduced the visual world so faithfully. Eugène Fromentin wrote in his *Les Maîtres d'autrefois,* which was first published in 1876 and quickly translated into most European languages and which is still frequently reprinted, that the only thing the Dutch succeeded in doing during their golden age of painting was to paint their own portrait. The word "portrait," Fromentin wrote, says everything. "Dutch painting, as one very soon perceives, was not and could not be anything but the portrait of Holland, its external image, faithful, exact, complete, life-like,

Figure 11.
AMBROSIUS BOSSCHAERT,
Bouquet.
Mauritshuis, The Hague.

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Figure 12.
MICHIEL VAN MUSSCHER,
Painter in a Studio.
Lord Northbrook Coll.,
London.

without any adornment. The portrait of men and places, of *bourgeois* customs, of squares, streets, and countryside, of sea and sky—such was bound to be, reduced to its primary elements, the programme adopted by the Dutch school; and such it was, from its first day until its decline."

There is no question that portraiture was the most popular branch of painting in seventeenth-century Holland. Thousands of Dutch faces were painted. According to an early biographer, one portraitist, the fashionable Delft painter Michiel van Miereveld, painted over five thousand during his lifetime. Portraits were made of substantial burghers, of children at play, of surgeons at work on cadavers, of the syndics of guilds around a ledger and ink-pot, of the regents of charitable institutions, and of members of municipal militia companies. These portraits are deceptively simple, and it is hard not to think that most Dutch portraitists were merely human kodaks, who made nothing but faithful, exact, complete, and life-like records of an uncle on the mother's side. However, if we compare a picture such as Frans Hals's group portrait of the "Banquet of the Officers of the St. Hadrian Militia Company of

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Haarlem" (Figure 9) with the kind of results a modern cameraman usually achieves when he takes a picture of a group (Figure 10), we see how intricate and original a Dutch portrait can be.

Both pictures show twelve men. There the similarity ends. The photographer lined up Yale's "Best in 51 years" like birds on a fence, or, more accurately, like birds on two fences—the athletes in the back row are standing on a bench. He succeeded in doing only part of the job which faces every group portraitist; he made portraits of each member of the group, but he failed to give us any idea of the character of the group or to show the relation of the men to it. In the photograph the group is completely subordinated to the individuals represented. Hals, on the other hand, successfully co-ordinated the individuals and the group. Not only is each individual brilliantly portrayed, but, by the use of gestures and glances, Hals indicates the relationship of the men to one another, as well as something about the character of the officer corps by showing its mood when around a festive board. It is not surprising to learn that in 1621, only six years before Hals's group portrait was painted,

Figure 13. JAN VAN GOYEN, The Haarlem Gate at Amsterdam, 1653. Municipal Museum, Amsterdam.

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Figure 14. GERBRAND VAN DEN EECKHOUT, The Haarlem Gate at Amsterdam.
Teyler Museum, Haarlem.

the Haarlem municipal authorities passed an ordinance limiting the banquets of the guardsmen to "three, or at most four days." The municipality paid for the banquets, and town officials objected when some of them lasted a week. The importance given to drinkers as well as to drinking glasses in the group portrait is not accidental. The same ordinance of 1621 gives some idea of the quantities of liquor consumed. It states that at the banquets the militia men could receive only three barrels of beer free of tax.

Now, of course, Hals did not paint his portraits of Dutch civic guards during the course of a banquet. He only deceives us into believing that he did. The powerful diagonal and vertical accents in his group portrait, the pattern in depth and on the surface of the canvas, the vivid color harmonies of black, orange, white, blue, and red, and the effect of bright sunlight in the life-size picture are all as carefully ordered as the elements in compositions made by other great Baroque masters. They were surely worked out after the event. It is also probably wrong to maintain that Hals made the officers pose for him while he painted them, with their heads tossed back or with a hand suspended over a plate of fresh oysters. There is no reason to assume that he was an ape of nature who could not depict arrested movement or instantaneous expressions unless he

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had a model in front of him. The same claim can be made for his contemporaries.

Seventeenth-century Dutch still-life painters seldom made their compositions from nature. Close examination of the works by the flower painters shows that their colorful bouquets are based on carefully executed preliminary studies which served as patterns, and that they were not painted from freshly cut flowers. The same tulips, irises, and lilies of the valley appear in more than one picture by Bosschaert the Elder (Figure 11). Other still-life specialists followed the same practice. The great rarity and expense of some of the flowers—particularly the tulips—in the seventeenth century precluded working from fresh blooms for each new picture. It is also noteworthy that Dutch flower painters sometimes put in a vase blossoms which do not bloom in the same season. Their monumental compositions, which are always arranged to show each blossom fully, often make one wonder how the vases which hold the bouquets managed to remain upright.

As a rule, Dutch landscape painters did not make their pictures directly from nature, either. Only a few seventeenth-century artists seem to have painted in the open air. Joachim von Sandrart writes that he first met Claude while he was painting the famous waterfall at Tivoli, but, as is well known, it did not become common practice for artists to paint landscapes from nature until the last century. Most seventeenth-century Dutch landscapists must have worked the way the painter does in Michiel van Musscher's picture of an artist at work in his studio (Figure 12). Their landscapes were based on preliminary studies made out-of-doors. The studies were worked up into finished compositions in the studios and, as in the still-life pictures, the same motif was frequently used by the same artist in more than one painting. Seventeenth-century Dutch landscapes which appear to be topographical views can be deceptive. Jan van Goyen's painting of the "Haarlem Gate at Amsterdam" (Figure 13), looks like an accurate representation of part of the wall of Holland's leading city, but the large body of water on the left of van Goyen's painting was never visible at this place during the seventeenth century. Gerbrand van den Eeckhout's drawing of the same site shows what it looked like in Van Goyen's time (Figure 14). Van Goyen put elements from a river landscape into his view of the landmark. The picture is enhanced by the addition. The vista to the imaginary horizon on the left gave van Goyen the opportunity to show the endless expanse of a cloud-filled Dutch sky as well as

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Figure 15.
CHARLES PHILLIPS, "The Assassin," an 18th-century mezzotint after Rembrandt's St. Bartholomew.

Figure 16.
REMBRANDT, St. Bartholomew, 1661. Major W. M. P. Kincaid Lennox Coll., Downton Castle, Ludlow.

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its towering height. His painting could be put in the category of landscapes Fritz Novotny aptly called *Mischlandschaften,* a category which should not be confused with what we in English would term *mish-mash* landscapes.

Although it is hardly necessary to labor the point that seventeenth-century Dutch artists did not merely paint what they saw before their eyes, it is still important to stress the fact that some Dutch paintings which appear to depict nothing more than a fragment of reality have symbolic or allegorical meaning. Our age is not the only one which needs this reminder. Around 1770, a mezzotint was published of Rembrandt's late painting of "St. Bartholomew" (Figure 15). The mezzotint, which was made in England by Charles Phillips, is a faithful copy of Rembrandt's half-length portrayal of the apostle, who is seen holding a knife in his right hand (Figure 16). The knife identifies the apostle as St. Bartholomew. It is a

Figure 17. JACOB VAN RUISDAEL, Jewish Cemetery.
The Detroit Institute of Arts.

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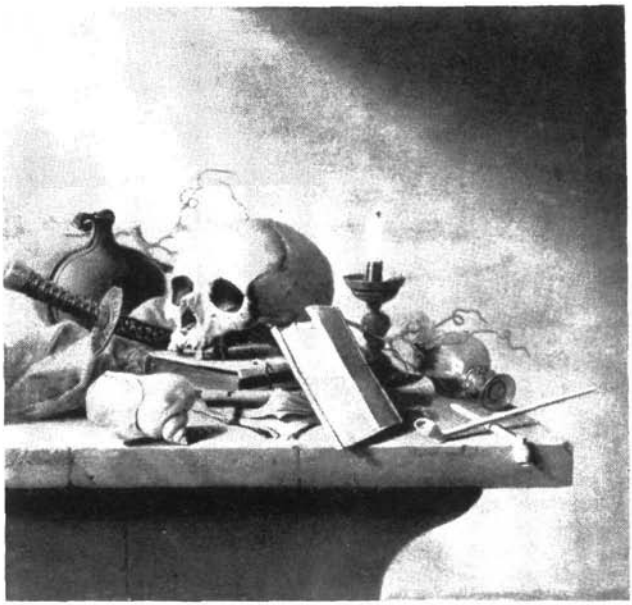

Figure 18. HARMEN STEENWIJCK, Vanitas: Still-life.
On loan from *Stichting Nederlandsch Kunstbezit*, Municipal Museum, Leiden.

reference to the tradition that he met his martyrdom by being flayed alive. Charles Phillips' mezzotint, however, is entitled "The Assassin," not "St. Bartholomew." Surely eighteenth-century artists knew that saints are represented with certain devices to insure recognition. But what seems to have been beyond the eighteenth-century engraver's ken was the idea that Rembrandt—or any seventeenth-century Dutchman—would make a picture of an apostle. Hence the man with a knife was dubbed "The Assassin." In the nineteenth century the knife led others to entitle the same picture "Rembrandt's Cook." The idea of Rembrandt's employing a chef in 1661—that is the date on the picture—would have surprised both Rembrandt and his creditors. The latter forced Holland's greatest artist into a kind of bankruptcy five years before the picture was painted. Yet another interpretation of Rembrandt's "St. Bartholomew" was made in 1893 when Emile Michel suggested in his monograph on the artist that the painting of the man with a knife was not Rembrandt's cook, but a portrait of a surgeon.

Seventeenth-century Dutch painters continued the well-established tradition of using man's actions, nature, and everyday objects to depict emblems and allegorical ideas, and to moralize. The

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Figure 19. COPY AFTER A LOST FRANS HALS, Vanitas: Boy with Bubbles. Virginia Museum of Fine Arts, Richmond.

late medieval tradition of using landscapes to show the months and the seasons continued. Scenes from nature were also used to denote the elements. Jacob van Ruisdael's "Jewish Cemetery" (Figure 17), one of the greatest landscapes of the period, which is based on studies Ruisdael made of the Jewish Cemetery still to be seen at Oudekerk near Amsterdam, was painted to remind men how relentless the natural and moral laws of the universe are. Man's edifices crumble, even as his body returns to dust. Only one thing in life is certain: death. Nothing is more uncertain than the hour death will strike. The admonition *memento mori* was a constant one during Renaissance and Baroque times.

A group of Dutch still-life painters (Figure 18) specialized in making still-life pictures of skulls, time pieces, snuffed-out candles, broken pipes, burned pieces of rope, books, musical instruments, money and jewels, which were looked upon as emblems of mortality to remind the viewer how transitory and fragile his pleasures are and how easily beauty and life are broken. *Vanitas vanitatis.*

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QVIS EVADET?
Flos nouus, et verna fragrans argenteus aura
Marcescit subitò, perit, ah, perit illa venustas.
Sic et vita hominum iam nunc nascentibus, eheu,
Instar abit bullæ vanis elapsa vaporis.

Figure 20. HENDRIK GOLTZIUS, "Qvis Evadet?," 1594.

The same theme is also found in some Dutch pictures which at first glance appear to be *genre pur*. The painting of a laughing boy with bubbles (Figure 19), which is probably an old copy of a lost work by Frans Hals, is most likely a *vanitas* picture. Was the original version of this picture, the unidentified "Vanitas" by Hals referred to in an inventory of Pieter Codde's effects at Amsterdam in 1636? An engraving, dated 1594, by Hendrik Goltzius, of a putto blowing bubbles while resting on a skull and with the inscription "Qvis Evadet?" and a poem which refers to the way man's life vanishes like a bubble or fleeting smoke, shows a more conventional way of treating the theme *Homo bulla* (Figure 20).

A seventeenth-century man did not need the skull, flowers, smoke, and Latin inscriptions to get the point. Not only is the comparison of man's life to a bubble found in the writings of the ancients, and

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Figure 21. PIETER BRUEGEL, Children's Games, 1560. Kunsthistorisches Museum, Vienna.

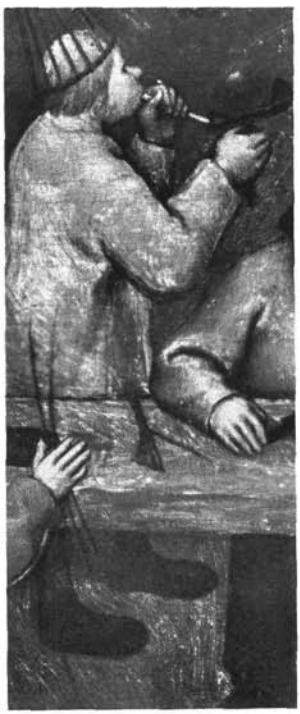

Figure 22. PIETER BRUEGEL, Boy Blowing a Bubble, detail from Children's Games.

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Figure 23. ANONYMOUS, Illustration for Jacob Cats's poem on children's games viewed as moralized emblems, 1618.

frequently invoked again after the fifteenth century, but also artists before Hals often used the subject of a child blowing bubbles to convey the idea that the life of man resembles things of small account. As it was put in *An Herbal for the Bible* published in 1587, man's life can be compared "to a Dreame, to a smoke, to a vapour, to a puffe of winde, to a shadow, to a bubble of water, to hay, to grasse, to an herb, to a flower, to a leave, to a tale, to vanitie, to a weaver's shuttle, to a winde, to dried stubble, to a post, to nothing." Pieter Bruegel's famous painting of "Children's Games" (Figure 21) is probably more than an encyclopedia of the diversions of children. Most likely, Bruegel wanted to draw a parallel between the affairs of children and their elders. If this is correct, the little boy blowing bubbles in the lower left corner of Bruegel's painting (Figure 22) is a reference to the idea that a moral can be drawn from bubble blowing. There can be no doubt that this was the intention of the Dutch poet, Jacob Cats, who published a poem in 1618 on children's games seen as moralized emblems. ("Kinderspel Gheduyt tot Sinne-Beelden, ende Leere der Zeden"). The fine engraving used to illustrate Cats's poem (Figure 23) shows more than a dozen games. Cats, as was his custom, wrote homely aphor-

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Figure 24.

Figure 24. FRANS HALS, Taste: Boy Drinking.
Figure 25. FRANS HALS, Hearing: Boy with Flute.
Both pictures in Museum, Schwerin.

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Figure 26.
JAN MIENSE MOLENAER,
The Five Senses:
Sight, Touch, Taste, Hearing, Smell.
Mauritshuis, The Hague.

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Figure 27. GERARD TERBORCH, so-called Parental Admonition. Staatliche Museen, Berlin-Dahlem.

isms on all of them. Of the amazed boy blowing bubbles in the engraving, Cats noted that the broken bubble reminds us that he who rises too quickly rides for a fall.

Frans Hals's genius was to take the bubble-blowing boy away from his numerous companions in a town square and make him the subject of an entire painting. Some of Hals's other pictures of single children also have allegorical meaning. His tondos which, in the literature, are called a "Boy Drinking" (Figure 24) and a "Boy with a Flute" (Figure 25) are probably two panels used to depict taste and hearing in a series of the Five Senses; the quality

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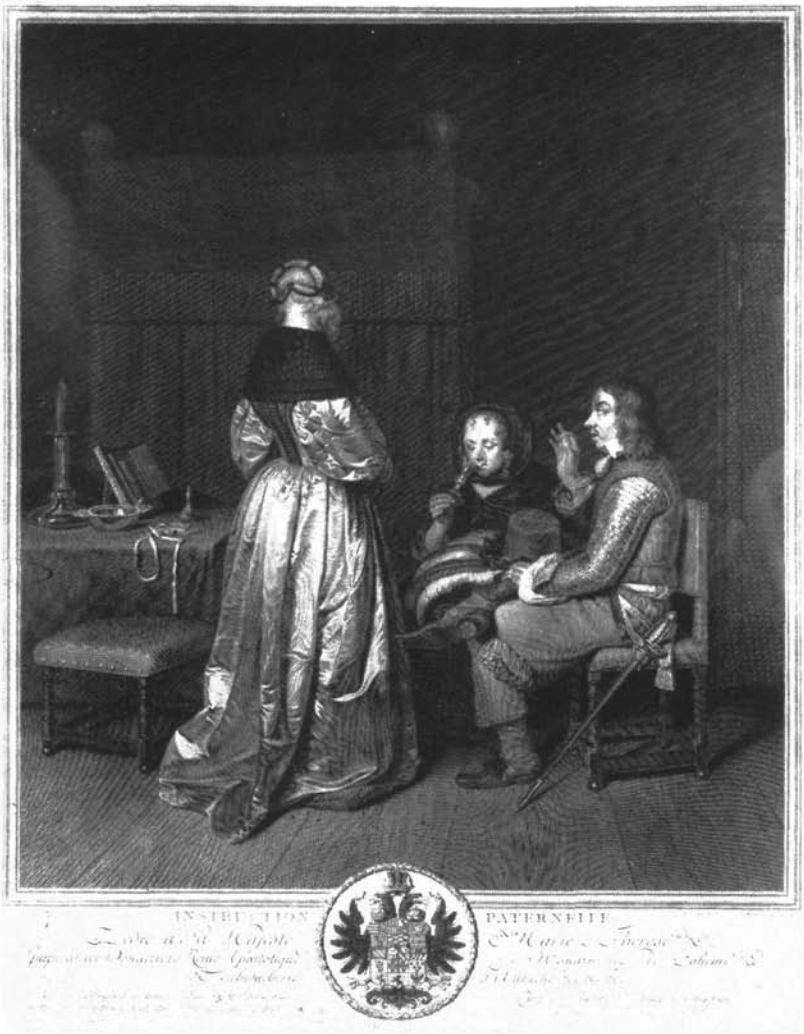

Figure 28. JOHANN GEORG WILLE, "Instruction Paternelle," 1765, engraving after Terborch's painting now in Berlin-Dahlem.

of these vivacious sketches animated by light and Hals's unmatched fluid touch make clear why the picture of the "Boy with Bubbles" (Figure 19) cannot be considered a work by the master himself. Other Dutch artists also used genre scenes to show the five senses. A series of five pictures by Jan Miense Molenaer of life amongst the lower classes depicts each of the senses (Figure 26). Additional

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Figure 29. GERARD TERBORCH, detail from the so-called Parental Admonition.

examples can be cited from the works of Jan Steen, Adriaen Ostade, Pieter de Hooch, and a host of others to show how the age, sex, manners, and social status of the figures, as well as their activities, could vary in representations of the theme of the five senses.

Once we realize that there may be more significance to seventeenth-century Dutch pictures than earlier critics thought, we run the risk of reading the wrong meaning into them. It is also possible to read too much meaning into them. Terborch's famous "Parental Admonition" (Figure 27), now in Berlin, offers a good illustration of the difficulties which can be encountered. The first reference to the title is found on an engraving made by Johann Georg Wille in 1765, which is inscribed "L'Instruction Paternelle" (Figure 28). Goethe based a passage in his novel *Die Wahlverwandschaften* on this print. He made characters in his novel act out a *tableau vivant* upon the basis of it, and Goethe described the well-known engraving for his readers. "One foot thrown over the other," he wrote, "sits a noble knightly looking father; his daughter stands before him, to whose conscience he seems to be addressing himself. She, a fine striking figure, in a folding drapery of white satin, is only to be seen from behind, but her whole bearing appears to signify that she is

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collecting herself. That the admonition is not too severe, that she is not being utterly put to shame, is to be gathered from the air and attitude of the father, while the mother seems as if she is looking into a glass of wine, which she is on the point of drinking."

Not all students of Dutch painting have accepted the eighteenth-century title given to Terborch's painting or Goethe's description of it. Dissenters state that it is not a minor episode in the life of a family, but that it is a tactful and unusually restrained depiction of a courtesan scene. They claim that the man Goethe described as a father admonishing his daughter is offering the standing woman a piece of money, and that the woman sipping wine is a procuress, not an embarrassed mother (Figure 29). It is particularly appropriate that Goethe's *Die Wahlverwandschaften* figures in this discussion of the possible interpretations of Terborch's picture. *Die*

Figure 30. DIRK VAN BABUREN, The Procuress.
Museum of Fine Arts, Boston.

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Wahlverwandshaften is a novel which deals with love, the nature of morality, and passion. It is a work which has been variously described as immoral, amoral, and moral, and, with the exception of *Faust*, no work of Goethe's has been interpreted in so many different ways and debated with such zeal.

The interpretation of Terborch's picture as a courtesan scene is not an impossible one. The theme is not unusual in seventeenth-century Dutch painting. It was frequently painted without much subtlety on a life-size scale by the Dutch followers of Caravaggio who worked in Utrecht during the 'twenties of the century. There is no need to debate the subject of Baburen's "Procuress," now at the Museum of Fine Arts in Boston (Figure 30). Vermeer handled the same subject in one of his earliest known pictures, and Terborch himself made pictures of men offering money to women, in which there can be little doubt about what is being purchased: one is in the Pushkin Museum at Moscow, another is the well-known "Gallant" at the Louvre.

Money is an indispensable prop in courtesan and procuress scenes. Without it, the character of the story changes. Where is the coin in Terborch's so-called "Parental Admonition"? It belongs between the thumb and forefinger of the seated man's right hand. The coin is not there. It has been suggested that it was painted out by a fastidious owner of the picture before it was engraved in the eighteenth century. However, a recent close examination of the picture has revealed no sign of a coin, and the specialist who conducted the search states that what has been taken for a coin in the father's hand is in fact the edge of the man's fingernail. This expert claims that the picture is neither a parental admonition, nor a courtesan scene, but a depiction of "The Tasting of Wine"—yet another theme not unknown in Holland during the seventeenth century. If this is the case, the seated man is neither admonishing his daughter nor offering the standing woman a coin, but is pressing the tip of his forefinger on the ball of his thumb to indicate that the wine is excellent.

Which of the three interpretations of Terborch's picture is correct? There is another autograph version of the painting in the Rijksmuseum at Amsterdam in which the characterizations of the man and drinking woman are superior to those in the Berlin picture. Unfortunately, the Amsterdam version does not answer the question. A crucial section of the Amsterdam painting—the area around the man's right hand—is abraded and it cannot be read properly.

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Figure 31. JAN VERMEER, Woman Putting on a Pearl Necklace. Staatliche Museen, Berlin-Dahlem.

We have been offered three interpretations of Terborch's picture. Which one is correct? Each man can be his own judge, but only after intimate knowledge of the picture has been acquired. We have seen how crucial it is to determine whether we are looking at the edge of a coin or a fingernail. It is also clear that before we can come to a sound conclusion about the theme of this little masterpiece of seventeenth-century Dutch painting, we must do precisely what is done when the signification of a work of any other epoch is dis-

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cerned: we must become familiar with the artist's personal predilections and tendencies, and acquire knowledge of the range of possibilities available to the age in which he lived.

Once we are conscious of what has become for us a kind of covert meaning in seventeenth-century Dutch painting, it is difficult to ignore it—if only to point out that here and there is a picture without any. However, while deciphering the profundities and what are in most cases the contrived conceits of their pictorial symbolism, we must not forget that Dutch painters also broke with the old tradition of disguising symbols under the cloak of real things. They painted the world for its own sake more frequently than they used it for allegorical and moral significance. They took intense delight in their own countryside, their seas and great rivers, and in the ordinary things at their elbow. They scrutinized and dallied over the familiar, the insignificant, and the commonplace, without moralizing or depreciating it. Theirs was an unprecedented pleasure in perceiving and painting the harmony of colors, the sparkling play of light, the mystery of shadow, and intangible space.

In an attempt to qualify the oversimplified generalizations made by earlier critics who censured or praised Dutch painters for their realism, care must be taken not to exaggerate the significance of the symbolic or allegorical meaning in their work. Vermeer's "Woman with a Pearl Necklace" (Figure 31) may very well be a *vanitas* or a representative of the sense of sight. Yet an undue emphasis on these commonplace Renaissance and Baroque themes at the expense of the quivering intimacy of this momentary scene of a woman studying herself in the mirror on the wall, the exquisite balance between her figure and the silvery daylight that fills the interior, the strong tectonic design, and the fine cool color accord, would impoverish, not enrich, our response to the unique achievement of seventeenth-century Dutch painting.

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RICHARD HOFSTADTER

The Child and the World

THE OBJECTIVES of John Dewey's educational theory, which were closely knit into his general philosophy, comprise a high set of ambitions. In the first instance, Dewey was trying to develop a theory of education—of the development of intelligence and the role of knowledge—which would be wholly consistent with Darwinism. For a thinker born in the year in which *The Origin of Species* was published, and intellectually raised during the flowering of evolutionary science, modern education would be nothing if not scientific.

Dewey began by conceiving of the individual learner as using his mind as an instrument to solve various problems presented by his environment, and he went on to develop a theory of education conceived as the growth of the learner. The modern educational system, he saw, must operate in an age of democracy, science, and industrialism; it should be the goal of education to be consistent with the requirements of this age. Above all, education should abandon those practices, based on a predemocratic and pre-industrial society, which accepted the leisured, aristocratic, and passive conception of knowledge as the contemplation of fixed verities. Dewey believed that he and his contemporaries confronted a series of artificial dualisms inherited from past ages which must now be surmounted. Primary among these was the dualism between knowledge and action. For Dewey, action is involved in knowledge—not, as some of his uncomprehending critics charged, in the sense that knowledge is subordinated to action and inferior to "practice," but in the sense that knowledge is a form of action, and that action is one of the terms by which knowledge is acquired and used.

Another of Dewey's quests was to seek out the educational correlates of a democratic and progressive society. This he translated into the query: How can one develop an educational system that

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will avoid perpetuating at the root all the flaws of existing society simply by molding children in its own image? If a democratic society is truly to serve all its members, it must devise schools in which, at the germinal point in childhood, these members will be able to develop their capacities, and, instead of simply reproducing the qualities of the larger society, will develop the capacity to improve them. It was in this sense that education was seen as a major force in social reconstruction. Plainly, if this were to be done, developing the regenerative contribution that the child is capable of making to society must be taken as a central objective. And this cannot be done unless the child is placed at the center of the school, and the rigid authority of the teacher and the traditional weight of the curriculum are displaced by his own developing interests and impulses. To mobilize these impulses and interests for learning, under gentle adult guidance, is not only to facilitate the learning process but also to form a type of character and mind suitable to the work of social reformation.

This is an excessively abbreviated statement of Dewey's theory, but it serves at least to indicate the formulation of his problems and to turn attention to the central personage in their solution—the figure of the child. It is here that we may begin, for it is the conception of the child—no mere intellectual construct but the focus of a set of deep emotional commitments and demands—that is at the core of the new education. To anticipate what must subsequently be elaborated at some length, I believe that the conception of the child that was formed by Dewey and his contemporaries, and that later entered into the stream of the new education, was more romantic and primitivist than it was post-Darwinian. This conception of the child and the surrounding preconceptions about his natural growth made it all the more difficult for Dewey and his followers to resolve those dualisms which he believed should be surmounted; and, despite his continuing efforts at clarification, it was difficult for him also to reconcile the centrality of the child with what proved still to be necessary in the way of order and authority in education. Finally, the penumbra of sanctity with which the figure of the child was surrounded made it hard to discuss realistically the role of democracy in education.

To understand the emotional commitment with which Dewey and his contemporaries approached the child, it is necessary to reconstruct some of the intellectual atmosphere around the turn of the century, when his generation began to work its transformation

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of American education. At this time, both in America and Europe, one can discern a quickening of interest in the child and a new turn in sentiment among those professionally concerned. In 1909 the Swedish feminist, Ellen Key, wrote her significantly entitled book, *The Century of the Child,* which epitomized the expectations of those who supposed that the child had been newly rediscovered. Expressions of this order, however, were becoming common coin. In 1900 the state superintendent of public instruction of Georgia presented at the annual meeting of the National Education Association an inspirational paper, "What Manner of Child Shall This Be?" In it he declared:[1]

> If I were asked what is to be accounted the great discovery of this century, I would pass by all the splendid achievements that men have wrought in wood and stone and iron and brass. I would not go to the volume that catalogs the printing-press, the loom, the steam-engine, the steamship, the ocean cable, the telegraph, the wireless telegraphy, the telephone, the phonograph. I would not go among the stars and point to either one of the planets that have been added to our solar system. I would not call for the Roentgen ray that promises to revolutionize the study of the human brain as well as the human body. I would pass over all the labor-saving machines and devices by which the work of the world has been marvelously multiplied. Above and beyond all these the index finger of the world's progress, in the march of time, would point unerringly to the little child as the one great discovery of the century now speeding to its close.

Having thus stated the importance he attached to the discovery of the little child, the school official went on to summarize the progress of the previous century from the days when, as he imagined, education had been "the exclusive privilege of an autocratic minority" and had been put at the disposal of "an all-powerful democratic majority." Freedom of opportunity had already been given to the American child, but further reforms were still in the making. "Already we Americans have discovered that the old system of education will not fit his case. . . . We have quit trying to fit the boy to a system. We are now trying to adjust a system to the boy." Turning to religious imagery, the official likened American teachers to Christ, in the sense that they were freeing the American child from shrouds and deadly cerements, as Christ had freed Lazarus, and were releasing him to grow. In the future, he declared with remarkable prescience, the Christian challenge to the teacher would rise still higher, for the teacher would be expected to save the humblest of God's children: "Time was when the power of the teacher was

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measured by what he could do with a bright boy or a bright girl. From the beginning of this new century the power of the teacher will be measured by what he will be able to do with the dull boy, the defective child. More than ever before in the history of this world the real test of teaching power will be measured, not by what can be done with the best, but by what can be done with the worst boy in the school." Thus the new educational psychology would be "the psychology of the prodigal son and the lost sheep." The "great rejoicings" in American life would come when child study is so mastered and the development of schools so perfected that the educational system touches and develops every American boy. "We shall come to our place of rejoicing when we have saved every one of these American children and made every one of them a contributor to the wealth, to the intelligence, and to the power of this great democratic government of ours."

I have cited these remarks because, though written by a working educator rather than a theorist, they sum up in brief a number of the convictions prevalent in what was then up-to-date educational thinking. They reflect its Christian fervor and benevolence; its sense of the centrality of the child in the modern world; its concern with democracy and opportunity as criteria of educational achievement; its conviction of the importance of the dull child and his demands on the educational system; its optimism about educational research and child study; its belief that education is to be defined essentially as growth; and its faith that a proper education, though focused on the self-realization of the individual child, would also automatically work toward the fulfillment and salvation of democratic society.

The Georgia school official may well have been reading the works of leading contemporaries in the field, for in the main his view of the child is in accord with what they were then writing. Perhaps it is sufficient to look at the three leading figures, Colonel Francis W. Parker, G. Stanley Hall, and John Dewey. Parker, whom Dewey once called the father of progressive education, was a man of exceptional vitality, a remarkably effective pedagogue, and a distinguished administrator. In the 1870's he remade the school system of Quincy, Massachusetts, achieving results that by the most impeccably traditional criteria of educational performance must be considered brilliant. Not long afterward, he became principal of the Cook County Normal School in Chicago, where he expanded his educational theories and his pedagogical techniques.

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There he undoubtedly set an important example for John Dewey, who was impressed by the Cook County Normal School before he set up his own "Laboratory School" in 1896, and also for G. Stanley Hall, who for a time made annual visits to Parker's school "to set my educational watch."

The terms in which Parker cast his educational theory were in many respects too old-fashioned to be in tune with the new currents of thought. For example, they were altogether pre-Darwinian and had no trace of the more sophisticated functionalist psychology which made Dewey's writings so widely appealing. But Parker's view of the child, which was in good part patterned after Froebel's, was of capital importance. "The child," he said, "is the climax and culmination of all God's creations,"[2] and to answer the question, What is the child? is to approach a knowledge of God. "He put into that child Himself his divinity, and . . . this divinity manifests itself in the seeking for truth through the visible and tangible. . . . The spontaneous tendencies of the child are the records of inborn divinity," he asserted. "We are here, my fellow-teachers, for one purpose, and that purpose is to understand these tendencies and continue them in all these directions, following nature." If the child was the bearer of divinity and "the fruit of all the past and the seed of all the future," it was natural enough to conclude that "the centre of all movement in education is *the child*." One may guess that Parker's concern with the spontaneous activities of the child were fruitful rather than stultifying partly because he also conceived of the child as omnivorously curious, as having a natural interest in all subjects, as being a sort of savant in the making, and a born artist and handcraftsman as well. Accordingly, he proposed a rather demanding curriculum, and unlike most later progressives he even believed in teaching grammar in all grades of the elementary school, since he thought it should be "thoroughly mastered."

As Dewey did later, Parker stressed the school as a community: "A school should be a model home, a complete community and embryonic democracy." Properly used, it could achieve an extraordinary reformation: "We must believe that we can save *every child*. The citizen should say in his heart: "I await the regeneration of the world from the teaching of the common schools of America."

The era in which these words were written was also the era in which G. Stanley Hall, the leader of the child-study movement, could say: "The guardians of the young should strive first of all to keep out of nature's way. . . . They should feel profoundly that child-

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hood, as it comes fresh from the hands of God, is not corrupt, but illustrates the survival of the most consummate thing in the world. . . . Nothing else is so worthy of love, reverence, and service as the body and soul of the growing child."[3] It was the era in which Dewey himself could say that "the child's own instincts and powers furnish the material and give the starting point for all education. . . . We violate the child's nature and render difficult the best ethical results by introducing the child too abruptly to a number of special studies, of reading, writing, geography, etc., out of relation to [his] social life. The true center of correlation on the school subjects is not science, nor literature, nor history, nor geography, but the child's own social activities."[4]

Here perhaps the romantic inheritance, as much or more than the appeal of post-Darwinian naturalism, may explain the charm of this view of the child to Dewey and his generation. The most elaborate statements of this view of the child come from European writers who applied romantic views to the case of the child. One finds Dewey referring with respect to Rousseau, Pestalozzi, and Froebel. The idea of education advanced at the turn of the century by these pedagogical reformers was romantic in the sense that they set up the development of the individual, his sensibility, the scope of his fancy, the urgency of his personal growth, against the imperatives of the social order, with its demand for specified bodies of knowledge, prescribed manners and morals, and a personal equipment suited to traditions and institutions. Theirs was a commitment to the natural child as against artificial society. To them the child came into this world trailing clouds of glory, and it was the holy office of the teacher to see that he remained free, and not to assist in imposing such alien codes on him. They envisaged a child life engaged more or less directly with nature and with activity, not with absorbing traditions meaningful only to adults or with reading books and mastering skills set, in disregard of the child's desires and interests, by adult society.

This view of education was again gaining currency among Western thinkers at the turn of the century; but unless I am mistaken, the United States provided an exceptionally receptive soil. This country had always had a strong penchant for child indulgence —it was an extremely common point of observation for nineteenth-century travelers in America. Moreover, American education, being in a singularly fluid state, offered less resistance than did the tra-

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dition-bound European educational systems to such attractive novelties. The evangelical climate of this country was also a force: the new educators' rhetoric about "saving" every American child, and their implied promise that the child saved would himself redeem civilization, point to this conclusion. It took decades before even so secular a thinker as Dewey lost the confidence evident in the young educational reformer of 1897, who believed that the good teacher would usher in "the true kingdom of God."

If we attend carefully to the overtones of the new educators' pronouncements, with their stress on such terms as spontaneity, instinct, activity, and nature, we become aware of how the problem of education is posed. The child is a phenomenon at once natural and divine—here post-Darwinian naturalism and the romantic heritage are linked—and the "natural" pattern of his needs and instincts becomes an imperative which it is profane for educators to violate.

We are now prepared to appreciate the significance of the central idea of the new educational thought: the school should base its studies, not on the demands of society nor on any conception of what an educated person should be, but on the developing needs and interests of the child. This does not mean merely that the nature of the child imposes negative limits on the educational process which it would be vain to try to surmount. It means that the nature of the child is a positive guide to educational procedure—that the child himself naturally and spontaneously generates the needs and impulses that should animate the educational process.

In a revealing article of 1901, "The Ideal School as Based on Child Study," G. Stanley Hall envisaged what this guiding principle would entail. He would try, he said, "to break away from all current practices, traditions, methods, and philosophies, for a brief moment, and ask *what education would be if based solely upon a fresh and comprehensive view of the nature and needs of childhood.*"[5] In short, he would strip away the inherited ideas of what education should be, which are the trappings of an outworn past, and assume that modern child study has learned what is of greater relevance to the purpose. Etymologically, Hall pointed out, the word for school meant leisure, "exemption from work, the perpetuation of the primeval paradise created before the struggle for existence began." In this sense, the school stood for health, growth and heredity, "a pound of which is worth a ton of instruction."

Because of the natural and sacred character of the child's health, leisure, and growth, every invasion of his time, every demand of the

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curriculum, must be doubly tried and conclusively justified before we subject him to it:

> We must overcome the fetichism of the alphabet, of the multiplication table, of grammars, of scales, and of bibliolatry, and must reflect that the invention of Cadmus seemed the sowing of veritable dragon's teeth in the brain; that Charlemagne and many other great men of the world could not read or write; that scholars have argued that Cornelia, Ophelia, Beatrice, and even the blessed mother of our Lord knew nothing of letters. The knights, the elite leaders of the Middle Ages, deemed writing a mere clerk's trick beneath the attention of all those who scorned to muddle their wits with others' ideas, feeling that their own were good enough for them.

Of course no one will imagine that Hall, who had received one of the best educations of his generation (and a very traditional one) at Harvard and the German universities thought that the goal of the new education would be the subversion of literacy. The importance of his views lay in the belief that there is a natural and normal course of child development to which bookish considerations should yield. Some of his particular suggestions were most sensible, and it is worth remarking that some are still practiced to good effect. It is interesting, too, that just as Parker clung to the value of grammar, Hall did not think that the study of the classical languages had been altogether eliminated by this emphasis on natural development. At least some children might well study them, Hall thought, and what is especially interesting to a contemporary reader, looking back over the span of seventy years, is that Hall felt that he knew quite precisely at what points in a child's development the study of these subjects was "natural." "As to the dead languages, if they are to be taught, Latin should be begun not later than ten or eleven and Greek never later than twelve or thirteen." A generation later most proponents of the new education had no use for these languages, and they would have been horrified to see either of them begun in the primary grades.

Hall's hopes for what could be realized in education through the scientific study of the child were avowedly utopian. He had "no shadow of doubt or fear" that, with a generous grant of funds and five years of experimentation, it would be possible to work out a program that would satisfy educational prophets and even persuade conservatives, "because the best things established will be in it."

> But it will be essentially pedocentric rather than scholicentric; it may be a little like the Reformation which insisted that the Sabbath, the

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Bible, and the Church were made for man and not he for them; it will fit both the practices and the results of modern science and psychological study; it will make religion and morals more effective; and, perhaps, above all, it will give individuality in the school its full rights as befits a republican form of government, and will contribute something to bring the race to the higher maturity of the superman that is to be, effectiveness in developing which is the highest and final test of art, science, religion, home, state, literature, and every human institution.

It will no doubt seem a far cry from Hall's hopes for ten-year-old Latinists and his call for the superman of the future to the work of the life-adjustment educators with their campaign against disciplinary subjects and their recommended class discussions on "How can I get everyone to participate in the activities at the party?" or "Should I have dates in junior high school?"[6] But utopias have a way of being short-circuited under the very eyes of their formulators.

The romantic and Darwinian backgrounds of the new education make it easier to understand why Dewey should have defined education as growth. In Dewey this conception that education is growth is no casual act of definition and no idle metaphor: it represents an attempt to locate and restate the very essence of the educational process. There is a frequently quoted passage in *Democracy and Education* which illustrates at once the disturbing quality of Dewey's style and the importance he attached to the conception of education as growth. There he wrote:[7]

> We have been occupied with the conditions and implications of growth. . . . When it is said that education is development, everything depends upon *how* development is conceived. Our net conclusion is that life is development, and that development, growing, is life. Translated into its educational equivalents, this means (i) that the educational process has no end beyond itself; it is its own end; and that (ii) the educational process is one of continual reorganizing, reconstructing, transforming. . . .
>
> Since in reality there is nothing to which growth is relative, save more growth, there is nothing to which education is subordinate save more education. . . . Education means the enterprise of supplying the conditions which insure growth, or adequacy of life, irrespective of age. . . .
>
> Since growth is the characteristic of life, education is all one with growing; it has no end beyond itself. The criterion of the value of school education is the extent in which it creates a desire for continued growth and supplies means for making the desire effective in fact.

The implications of this declaration must be reckoned with: we are not asked to consider that education resembles growth, or that it

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has something in common with growth or may be thought of as a special form of growth. We are being urged to consider that education *is* growth; that growth is life; that life is development; and, above all, that it is meaningless to try to provide ends for education, since it has no possible end other than more education. "The aim of education is to enable individuals to continue their education."[8]

The idea that education is growth is at first sight all but irresistible. Certainly education is not a form of shrinkage. To say that it is growth seems to assert a desirable linkage between the learning process and the world of nature. It is refreshingly unmechanical. It does justice to our sense that education is cumulative and self-enlarging, and that it leads toward a mind and character that become larger, more complex, more powerful, and yet finer. Yet several critics have contended that the idea that education is growth was the source of endless difficulties; and I believe that in the hands of some of Dewey's followers it became one of the most mischievous metaphors in the history of modern education.

Since the idea of growth is intrinsically a biological metaphor and an individualistic conception, its effect was of necessity to turn the mind away from the social to the personal function of education; it became an assertion, not of the child's place in society, but rather of his interests as against those of society. It invited educational thinkers to set up an invidious contrast between self-determining, self-directing growth from within, which was good, and molding from without, which was bad. Students of Dewey's philosophy might readily object to any portrayal of his educational thought as oriented excessively toward the biological and individual, and as insufficiently mindful of the collective and social. What writer on education, it might be asked, ever spoke more positively about the social character of the educational process and its ultimate social function?

The problem, however, did not arise from any lack of awareness on Dewey's part of the social character of education; it arose from the fact that the concept of individual growth became a hostage in the hands of educational thinkers who were obsessed with the child-centered school. Although Dewey himself did not accept the antithesis between the child and society as a finality—indeed he hoped to achieve a harmonious synthesis of the two—the historical effect of the conception of education as growth was to exalt the child and to dismiss the problem of society, on the ground that the growth of the child stood for health, while the traditions of society (including curricular traditions) stood for outworn, excessively

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authoritative demands. "The authority of society," wrote one leading psychologist in this tradition, "or of any part of society is not presented to the child as a guide to conduct. Reliance is placed on the experience of each individual child. The experience of the race in discovering what line of conduct works out satisfactorily and what does not is utilized only in so far as the child sees fit to appeal to it."[9]

Dewey himself never argued for a directionless education, as critics and followers have often thought. On this point at least he was perfectly clear. He often said in his early as well as his later educational writings that the child himself, unguided, is not capable of spinning out the proper content of his education; that every superficial act or interest, every stray impulse, of the child is not necessarily valuable; that the teacher must somehow, without imposing "external" ends, guide, direct, and develop those impulses of the child that are moving "forward."

Dewey's difficulty was of another order: having insisted that education, itself being growth, cannot have any end set for it save still more education, he was unable to formulate the criteria by which society, through the teacher, should guide or direct the child's impulses. The teacher was left with a firm mandate to exercise some guidance, to make some discriminations among the child's impulses and needs, but with no directional signposts. The child's impulses should be guided "forward"—but in which direction? For to have such a set of criteria is to have an educational end in view, an adult prevision of what the child should know and what he should be. "Let the child's nature fulfill its destiny,"[10] Dewey urged; but the suggestion that the child has a destiny implied an end or goal somewhat removed in time, one not envisaged by the child. For this reason, what came to be called progressive education, while often immensely fertile and ingenious concerning means, proved so futile and confused about its ends; while it had much of the highest value to say on teaching methods, it was quite unclear, often anarchic, about what these methods should be used to teach. Hence it could make remarkably effective beginnings at mobilizing the child's interests for learning, but then it often ended by allowing these interests to displace learning. The more certain it was of its techniques, the less explicit it was about its goals—perhaps in this respect it constituted a parable on American life.

Dewey's own vagueness about the curriculum is understandable in the light of this conception of education as growth. Naturally, in the course of his career he wrote a good deal about the curricu-

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lum; but it is difficult to discover what he thought a good curriculum should be, or rather what the various alternative curricula should be, in the American school system. This absence of curricular commitments was consistent with his proposition that no goals should be formulated for education, since its only legitimate end is the capacity for still further education. By the time he wrote *Democracy and Education*, Dewey had become convinced that "the curriculum is always getting loaded down with purely inherited traditional matter," and that it therefore needs "constant inspection, criticism, and revision." He was concerned too that the curriculum "probably represents the values of adults rather than those of children and youth, or those of pupils a generation ago rather than those of the present day." Here he seems to lend his authority to those who believed that the curriculum should be shaped in accordance with the expressed desires of children and that it should be largely discontinuous from generation to generation, if not from year to year—for the recommended inspection and revision are not intermittent but "constant."

On one count Dewey was completely forthright: "As long as any topic makes an immediate appeal, it is not necessary to ask what it is good for." Here he favored his readers with one of his rare concrete illustrations: "It is unsound to urge that, say, Latin has a value *per se* in the abstract, just as a study, as sufficient justification for teaching it." Thus far it is easy to assent; but Dewey went on to add that we do not need to justify Latin by attributing to it some definite use in the future. "When pupils are genuinely concerned in learning Latin, that is of itself proof that it possesses value."[11]

Now the intention of this was plainly innocent enough, for the context showed that Dewey was simply saying that he set a high value on the pupils' spontaneous appreciation of what they were studying. This did not mean that they were to study whatever was pleasurable. In at least one work he had warned educators against trying to exploit "what is merely pleasure-giving, exciting, or transient."[12] Yet there seems no way of avoiding the conclusion that if the value of every study was to be, as he urged, dependent always on the concrete situation in which the choice of studies was to be made, then the kind of long-range evaluation of subjects which is necessary in designing curricula becomes inordinately difficult. "In the abstract," said Dewey, "there is no such thing as degrees or order of value." Therefore, "We cannot establish a hierarchy of values among studies."[13]

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Again one may be tempted to agree, if by hierarchy one means that studies are assigned an eternal value equally applicable to all pupils. It is too easy to conclude from this proposition, however, that any subject is the equal of any other, and that (as the National Education Association later put it), "Mathematics and mechanics, art and agriculture, history and homemaking are all peers." A pupil's "genuine concern" to learn Latin was for Dewey sufficient proof of its value. If for "Latin" one substitutes "driver education" or "beauty culture," considering each as justified if it makes "an immediate appeal," one senses the game that later educators played with Dewey's principles. Such substitutions Dewey himself would presumably not have made; but in his philosophy there are no barriers against them.

The bearing of Dewey's philosophy on the design of curricular systems was devastating. Even if one is aware of the conditional and limited character of any hierarchy of values one may establish among subjects, one must have such a hierarchy in mind to design a curriculum that runs over the course of several years, for its lower years must be in some measure the prerequisite to certain choices in later years. An urgent desire to learn Latin or any other subject is not a "natural" impulse in any child. In Dewey's words, children can become "genuinely concerned" to learn Latin only if adult society decides that it is good for some of them to have that choice, and at what age it should be made possible for them, and only if adult society arranges the prior curricular, social, and intellectual experiences of these children in such a way as to make the choice between Latin or no Latin possible and meaningful for them. In short, some part of the adult community must have convictions about the curriculum, and be willing to organize it accordingly. Such organization, though leaving the child a considerable margin of choice, would go beyond that classroom "guidance" and "direction" that Dewey explicitly allowed for.

The ideal of growth was the primary expression of Dewey's concern with the individual; the ideal of education in the service of democracy was the expression of his sense of the social function of education. Although I have suggested that the ideal of growth committed many educators to an antisocietal bias, this was not Dewey's view, for he believed that individual growth and the interests of a democratic social order, far from being in any ineluctable antagonism, were susceptible to a completely harmonious synthesis. In his

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eyes the new education was to be anything but anarchistic or ultra-individualistic. For the child, now released from traditional restraints, would be raised nonetheless to social responsibilities; it was only that these would be defined as responsibilities to his peers and to the future. The new education itself would have social responsibilities more demanding and more freighted with social significance than the education of the past. Its goal would be nothing less than the fullest realization of the principles of democracy. In setting this aspiration, Dewey stood firmly within the American tradition, for the great educational reformers who had established the common school system had also been concerned with its potential value to democracy. He was also wholly in tune with his times, for the revival and enlargement of American democracy was one of the essential aspirations of the progressive era.

Traditional education, Dewey believed, had been founded on theories of knowledge and moral development congenial only to predemocratic society, and, in so far as it was still operative in democratic society, it hampered the realization of the democratic ideal. From the time of classical antiquity onward, the division of society into a leisured and aristocratic class, which was the custodian of learning, and an enslaved or working class, which was engaged with work and practical knowledge, had encouraged a fatal separation of knowledge and action.

In a democratic society, however, in which almost everyone has a function, and in which there are many shared interests and objectives, it should be possible to surmount this separation and arrive at an understanding of knowledge which does full justice to the element of social action involved in it. A society which is both democratic and progressive "must have a type of education which gives individuals a personal interest in social relationships and control, and the habits of mind which secure social changes without introducing disorder."[14]

Dewey did not at any time fall victim to the delusion that the whole burden of social change could be put on the educational process. Direct instruction and exhortation, he remarked in *Democracy and Education*, could not in themselves bring about changes in mind and character; such changes would also require changes, of a type he did not clearly specify, in "industrial and political conditions." But education could make a vital contribution: "We may produce in schools a projection in type of the society we should like to realize, and by forming minds in accord with it gradually modify

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the larger and more recalcitrant features of society."[15] This sentence concisely expresses Dewey's demand on the schools in behalf of democracy, and also a central difficulty in his educational philosophy: for he was obliged to assume that there was a kind of pre-established harmony between the needs and interests of the child and "the society we should like to realize." Otherwise, it would be necessary either to sacrifice the ideal of education as growth or to abandon the goal of "forming minds" in accordance with an adult, and hence externally imposed, vision of the good society.

Dewey's conception of the manner in which education would serve democracy is somewhat different from that formulated by earlier educational reformers. They had envisaged that a common school system would enlarge opportunities for the common man, while at the same time endowing the whole population with those mental and moral qualities deemed necessary to a popular form of government. They were traditional, in the sense that they envisaged adult society as formulating the ends of education and devising curricula to suit them. Since this was unacceptable to Dewey, he sought for another, more subtle, more pervasive, and yet more "natural" formulation of the relation between democracy and education. One consequence of this view was that his *Democracy and Education* had almost nothing to say about the class structure of American society, or the relation of educational opportunity to this structure, or the means of extending opportunities to increase social mobility and break down class barriers. In short, his view of the problem of education and democracy was not an economic, or sociological, or even a political one, except in the broadest sense; it was largely a psychological or sociopsychological one. In Dewey's theory the ends of democratic education are to be served by the socialization of the child, who is to be made into a cooperative rather than a competitive being and "saturated" with the spirit of service.

Dewey began with a forceful rejection of systems of education based on class stratification; for, as he saw it, it was the co-existence of a leisured and learned class and an enslaved or working class that led to an unhealthy split between learning and utility. The opposition between learning and utility, between thought and action, can be surmounted only in a democratic educational system, which mixes the children of varying backgrounds and does not try to reproduce in their schooling the class barriers of their society. A democracy, he argued, "is more than a form of government; it is primarily a mode of associated living, of conjoint communicated

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experience."[16] The problem of the democratic educator is to make of the school a specialized environment, a miniature community, an embryonic society, which will eliminate so far as possible the undesirable features of the larger environment of society. For an enlightened society will try to transmit, not simply the whole of its achievements, but only "such as make for a better future society."[17]

What would be the characteristics of the democratic school community? The teacher, of course, would no longer be a harsh authority imposing external goals through rigid methods. He would be alert to the spontaneous and natural impulses of the children and would take hold of those that led toward constructive ends, giving gentle direction where necessary. The pupils themselves would take an active part in forming the purposes of their own education and in planning its execution. Their learning would not be individual or passive, but collective and active; and in the course of their work they would learn to share ideas and experiences, to develop mutual considerations and respect, and to acquire a capacity for cooperation. These habits, writ large, would some day reshape the larger society itself, for, as Dewey put it in one of his less fortunate sentences, "In directing the activities of the young, society determines its own future in determining that of the young."[18]

Democratic goals would have profound consequences for content as well as method; for as soon as the inherited notion of learning as a leisure-class activity is discarded, the style of education it represents also falls under question, being suited neither to democracy, nor to industrialism, nor to an age of science. The circulation of learning in modern times has relieved it from its class associations. Intellectual stimuli may be found everywhere. "The merely intellectual life, the life of scholarship and learning, thus gets a very altered value. Academic and scholastic, instead of being titles of honor, are becoming terms of reproach." But we are still trying to throw off the shackles of this "medieval conception of learning"—a conception "which appeals for the most part simply to the intellectual aspect of our natures, our desire to learn, to accumulate information, and to get control of the symbols of learning; not to our impulses and tendencies to make, to do, to create, to produce, whether in the form of utility or art."

In fact, the intellectual type of education can be of significance only to a minority: "The simple facts of the case are that in the great majority of human beings the distinctively intellectual interest

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is not dominant. They have the so-called practical impulse and disposition." It is for this reason so many leave school as soon as they have learned the rudiments of reading, writing, and calculating. On the other hand, "If we were to conceive our educational end and aim in a less exclusive way, if we were to introduce into educational processes the activities which appeal to those whose dominant interest is to do and to make, we should find the hold of the school upon its members to be more vital, more prolonged, containing more of culture." Education is already changing in this direction, Dewey remarked, and holds great promise for the future when the new tendencies are put into "complete, uncompromising possession of our school system." "When the school introduces and trains each child of society into membership within such a little community, saturating him with the spirit of service, and providing him with the instruments of effective self-direction, we shall have the deepest and best guaranty of a larger society which is worthy, lovely, and harmonious."[19]

In attempting to realize their social ideals, Dewey and his followers were in time confronted by a certain antagonism between their fear of adult authority and their desire for social reform. Dewey, as I have pointed out, had always endorsed adult guidance in the classroom. What he had opposed was the idea that adults should formulate ends or goals for education, since the principle of growth demanded that it have no end. But the stronger the forces of social reform grew within the ranks of educators, the more evident it became that the ideal of social reform was after all an adult end, and that to realize it the cooperation of children could not be automatically counted on.

This truth became particularly evident during the reaction to the great depression. In 1938, by the time Dewey came to write *Experience and Education*, he felt impelled to warn more sharply than ever that the new education had gone too far when it made teachers afraid to offer suggestions in the classroom. He had even heard of cases in which children were surrounded with objects and materials and then left entirely to themselves, because the teacher felt it wrong to indicate what might be done with them. "Why, then, even supply materials, since they are a source of some suggestion or other?" Still, it is the function of the teacher to act only as the leader of the group's activities, and to give such directives as he issues only in the group's interest and not "as an exhibition of personal power."

The nagging fear of adult authority remains—the fear of forcing

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"the activity of the young into channels which express the teacher's purpose rather than that of the pupils." The soundest thing in the new education, he reiterated, was its emphasis on "the participation of the learner in the formation of the purposes which direct his activities in the learning process." Yet, as Dewey also remarked, "the formation of purposes is . . . a rather complex intellectual operation," and, as he did not remark, it was difficult to show how the very young could take much part in such an operation.[20] He was uneasily aware that the progressive schools were having great difficulty in organizing curricula,[21] but it is uncertain whether he saw that this difficulty might have arisen from the expectation that young children could enlist in an operation of considerable intellectual complexity.

Dewey's anxiety about adult authority stemmed from his desire to avoid something we are still trying with much difficulty to avoid, and that is the inculcation of conformist habits in the child. If there was anything he did *not* want, it was to breed conformist character. But he saw the danger of conformity only as arising from adult society and from its surrogate, the teacher. Speaking of traditional education, he wrote:[22]

> Since conformity is the aim, what is distinctively individual in a young person is brushed aside, or regarded as a source of mischief or anarchy. Conformity is made equivalent to uniformity. Consequently, there are induced lack of interest in the novel, aversion to progress, and dread of the uncertain and the unknown.

Dewey's mind was thus so sharply focused on the idea of adult authority as a threat to the child that it was hard for him to conceive of the child's peers as also constituting a threat. One can hardly believe that he really intended to liberate the child from the adult world only to throw him into the clutches of an even more omnivorous peer-culture. Yet there was very little place in Dewey's schoolroom for the contemplative or bookish child, for whom schooling as social activity is not a thoroughly satisfactory procedure. "In social situations," Dewey approvingly wrote, "the young have to refer their way of acting to what others are doing and make it fit in."[23] It was just this kind of activity that provided the participants with a common understanding. Was there not, in his view of the matter, more than a little suspicion of the child who remained aloof or hung back from social activity, who insisted on a singular measure of independence? "Dependence," Dewey wrote,[24]

> . . . denotes a power rather than a weakness; it involves inter-depend-

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ence. There is always a danger that increased personal independence will decrease the social capacity of an individual. In making him more self-reliant, it may make him more self-sufficient; it may lead to an aloofness and indifference. It often makes an individual so insensitive in his relations to others as to develop an illusion of really being able to stand alone and act alone—an unnamed form of insanity which is responsible for a large part of the remediable suffering of the world.

These words are altogether intelligible against the background of nineteenth-century America. The rampant economic individualism that Dewey could see at work in his formative years had created a personal type that was indeed independent, if not to the point of insanity, at least to the point of being antisocial. And in the schoolroom the older education had given scope to the impulses of occasional teachers who were harshly authoritarian. It would probably be too much to expect anyone in 1916 to envisage the emergence among children of the kind of peer-group conformity that David Riesman has diagnosed in *The Lonely Crowd*, or the observable decline in adult authority both in the classroom and in the regulation of children's lives. Today, when we grow disturbed about conformity in children, we are more often troubled about their conformity to the mandates of their peers and to directives taken from the mass media than we are by their conformity to parents or teachers. We are also aware of the possibility that excessive weakness in adult authority may even create difficulties for children quite as acute as those caused by adult tyranny.

These things did not enter into Dewey's world when his educational theory was being formed; but it is possible that his theory itself has helped to bring about a state of affairs that he could hardly have desired. The core-curriculum educators invoke Dewey's principles of immediacy, utility, and social learning when they encourage school children to discuss, "How can I be popular?" or, "Why are my parents so strict?" or, "What can I do with my old-fashioned parents?" or "Should I follow my crowd or obey my parents' wishes?"[25] Such topics represent the projection of peer-conformity into the curriculum itself in a way that Dewey would surely have found offensive. The problem of conformity and authority was real enough, but it was not solved by reforming the old-fashioned classroom.

Perhaps Dewey somewhat overvalued the social side of learning. He and other thinkers of his generation, notably George H. Mead, were much concerned to establish the intrinsically social character of mind, and they were eminently successful in this effort. In a

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sense, however, this view of mind proved almost too much to justify Dewey's view of education. If all mental activity is intrinsically social, then the social prerequisites of learning can be met in a wide variety of types of learning, not merely in the literal social cooperation of the classroom. As the new educators were somewhat reluctant to see, a lone child reading about what Dewey called the "products" of the past was engaging in a social experience at least as complex, if of a different kind, as that of a child in the school workshop making model ships with other children. Yet in Dewey's work the persuasive idea that a thing acquires meaning from its being a social object is at times transmuted into the more questionable idea that all learning has to be overtly shared in social action.

Even more important is a conception of the relationship between the educational process and its outcome which seems to me excessively mechanical, especially for one who, like Dewey, hoped always to do justice to the dialectical fluidity of life. The notion that the authoritative classroom would of necessity produce the conformist mind, and that sociable learning would produce the ideally socialized personality is at first appealing, but it has a kind of rigid rationality that life constantly eludes. Did Dewey, for example, really imagine that traditional education had engendered in America, of all places, a type of mind notably characterized by "lack of interest in the novel, aversion to progress, and dread of the uncertain and the unknown"? Was it necessarily true that education founded upon authority invariably produces a conformist mind, and that there is a one-to-one relationship between the style of an educational system and the nature of its products? There hardly seems any place in Dewey's idea of the educational process for the fact that Voltaire was schooled by the Jesuits, or that the strong authoritative structure of the Puritan family should have yielded a personal type so important to the development of modern democracy. To expect that education would so simply produce a hoped-for personal type was to expect more than past experience had promised.

Finally, there seem to be serious difficulties involved in living up to the idea that education should in no way be looked upon as a preparation for the child's future life—what Dewey always called a "remote future"—but rather as living itself, a simulacrum of life, or a sort of rehearsal in the experiences that make up life. The motive of achieving some continuity between school experience and other experiences seems altogether commendable. But while Dewey held that education *is* life, he continued to say that the school should

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provide a *selective* environment for the child, an environment that represents so far as possible what is deemed good in society and that eliminates what is bad. Perhaps the more successful it was in this aspect, the less it could live up to the ideal of representing or embodying life. The moment we admit that it is not the whole of life that one presents to children in school, we also admit having set up a selective process whose content is determined by some external end. Again one embraces the traditional view that education is after all not a comprehensive attempt to mirror or reproduce life, but a segment of life that is specialized for a distinct function.

If the new educators had really wanted to reproduce life itself in the classroom, they must have had an extraordinarily benign conception of what life is. To every adult life brings, in addition to some measure of cooperation, achievement, and joy, a full stint of competition, defeat, frustration, and failure. But the new educators did not accept the idea that these things too would be embodied in the little community that was to be organized for children in the school. On the contrary, their strongest impulse was to protect children from too acute a realization of what their own limitations, under adult conditions, might cost them. They were much closer to the position of Marietta Johnson, one of the pioneers of "organic education" and a founder of the Progressive Education Association, who said: "No child should ever know failure. . . . The school should meet the demands of the nature of childhood, not make demands. Any school system in which one child may fail while another succeeds is unjust, undemocratic, uneducational."[26] In her experimental school at Fairhope, Alabama, which was described with enthusiasm by John and Evelyn Dewey in *Schools of Tomorrow*, there were therefore no examinations, no grading, no failures to win promotion; success was measured not by having learned a certain amount of subject matter or by earning promotion, but by the effort and joy of the work itself. This view of education may or may not have better effects on children than the traditional school, but that it bears a closer relation to "life" is eminently questionable.

To this objection the new educators believed they had a satisfactory answer: the new education was not trying to raise children to know or fit into the life of the past, with its harsh and selfish individualism, but to the life of the present and future which was hopefully conceived as more social, more cooperative, more humane—to a life that Dewey thought accorded better with "the scientific democratic society of today."[27]

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Again there was a problem involved in designing education to suit the child's growth and at the same time to form a society that did not yet exist. As time went on some of the new educators themselves began to doubt that Dewey had successfully synthesized the idea of education as the child's growth and education as the reconstruction of society. Boyd H. Bode observed in 1938 that "The doctrine of growth in its present form prevents the teacher from discovering that he needs a guiding social philosophy."[28] To believe that Dewey's synthesis was successful required a certain credulity about the pre-established harmony between child nature and democratic culture that not everyone could share. It seemed to some critics that one would have to give up either the emphasis on child nature and spontaneity or the emphasis on educating for democracy. The child, after all, might feel a natural interest in rebelling at some point or other; but it was impossible to impute to him a natural interest in the reconstruction of society or in having his mind "saturated" with "the spirit of service." During the Great Depression, the whole school of social reconstructionists tended to recognize quite candidly that this impulse was lacking; that the future good of society required that educators recognize that all education embodies a measure of indoctrination; and that "external" ends are inevitably imposed in the educational process. Social reconstructionism in education has not been of much lasting interest, but it did some service in re-establishing among progressive educators an awareness of the fact that "external"—that is, adult—objectives are unavoidably dominant in the school. For those who expected that education would be, as Dewey had in 1897, the fundamental method of social progress and reform, it would be impossible to leave it as much as he might have hoped in the hands of the child.

Dewey's educational theory was formed in the hope that a proper educational synthesis would overcome certain ancient polarities and dualisms in educational thought. The antitheses between the child and society, interest and discipline, vocation and culture, knowledge and action, must all be resolved and ultimately harmonized, as they now can be in a democratic society which has surpassed the aristocratic framework in which these antitheses originally appeared. This optimism is vital to Dewey's educational argument: he saw these dualisms in education, not as a clue to the nature of human problems, but as an unfortunate legacy that could be done away with. When he published his earlier and most influential educa-

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tional books, the world was indeed progressing. In his view the age of science and democracy would be better, more rational, more intelligent than anything man had known in the past; it would be at once the source and the beneficiary of a better kind of education.

There was thus a distinct if rather covert utopianism about Dewey's educational thought. It was this utopian element that so many educational theorists found appealing. Dewey's utopianism was not based upon some portrait of an ideal educational system. He was too wise to draw a blueprint for a finished world, and the very nature of his thesis that education is the continuous reconstruction of experience argued against it. His utopianism was one of method: he believed that the old polarities and dualisms were not, so to speak, qualities in reality that must be resisted, minimized, and confined, but were miscalculations derived from a false conception of the world that had prevailed in the past. One could do better than merely resolve these miscalculations in various limited and inevitably unsatisfactory ways: in a higher synthesis they could be overcome altogether.

In this respect Dewey echoes that argument against the past which had been sounded by so many American thinkers before him. His language gives the impression that he saw the entire drama of human experience as a source of errors that must be surmounted. For him, to keep alive any current enterprise like education meant enabling it to peel off the residues of the past. "The present," he wrote in an eloquent passage in *Democracy and Education*, "is not just something which comes after the past. . . . It is what life is in leaving the past behind us." For this reason, the study of the cultural *products* of the past will not help us understand the present. It is the *life* of the past that counts, the life of which these cultural products are only dead repositories—and that life at its best was also a process of surmounting its own past. "A knowledge of the past and its heritage is of great significance when it enters into the present, but not otherwise." To make the study of the past the main material of education is to lose the vital connection between present and past, "and tends to make the past a rival of the present and the present a more or less futile imitation of the past. Under such circumstances," Dewey goes on, scoring what seems to be the climactic point in his argument, "culture becomes an ornament and solace; a refuge and an asylum."[29] It thus loses its capacity to be a transforming agent, one that can improve the present and create the future.

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Here we must return to the child, for the child is the key to the future. He has within himself the resources to liberate the world from the weight of its past. Before he can do this, however, the child himself must be freed—and under a proper educational regime he really *can* be freed—from the oppressions of the world, from everything that is dead about the apparatus of culture, from the constricting effects of society on the school. Dewey himself was realistic enough to see the limitations of the child's spontaneous impulses as a guide to this process. But it was exactly these impulses that interested American educators. Since Dewey aimed at freeing the child from the shackles of the past to the point at which the child could make a reconstructive use of past culture, American educators seized upon his theory as having downgraded past culture and its merely ornamental and solacing "products" and as having finally produced a program to liberate the child for unimpeded growth. Having once placed the child so firmly at the center, having defined education as growth without end, Dewey had so weighted the discussion of educational goals that a quarter-century of clarifying statements could not check the anti-intellectual perversions of his theory.

Like Freud, Dewey saw the process by which a society inculcates the young with its principles, inhibitions, and habits as a kind of imposition on youth. But Dewey's assumptions led to a more optimistic calculus of possibilities than that offered by Freud, who saw the process by which the individual is socialized as making genuinely impairing demands on his instincts but also as being in some form tragically inevitable. Society, as Dewey saw it, spoiled the "plasticity" of children, which was the source of their "power to change prevailing custom." Education, with its "insolent coercions, insinuating briberies, and pedagogic solemnities by which the freshness of youth can be faded and its vivid curiosities dulled," had become "the art of taking advantage of the helplessness of the young,"[30] and thus education had become the art by which society chokes off the best part of its capacity for self-improvement. For Dewey, the world as a source of misery for the child is largely remediable through the educational process; for Freud the two are fixed in an opposition which, while alterable and even to a degree ameliorable in detail, is immovable in substance.

More than a generation of progressive educational experiment confirms Freud's view. Old educational failings have been remedied, often with much success, but other problems have been intensified

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by the new remedies. Conformity to arbitrary adult wishes has been diminished, but conformity to peers is now seen as a serious problem. The arbitrary authority of the teacher has been lowered, but a subtle manipulation, which requires self-deceit on the part of the teacher and often inspires resentment in the child, has taken its place. The fear of failure in studies has not been removed, but devices to remove it have introduced frustrations arising from a lack of standards, of recognition, of a sense of achievement.

In his last significant statement on education, Dewey observed that "the drive of established institutions is to assimilate and distort the new into conformity with themselves," and, while commenting with some satisfaction on certain improvements introduced by progressive education, he ruefully remarked that the ideas and principles he had helped to develop had also succumbed to this process of institutionalization. "In teachers' colleges and elsewhere the ideas and principles have been converted into a fixed subject matter of ready-made rules, to be taught and memorized according to certain standardized procedures." Memorization and standardized procedures once more! It did all too little good, he said, to train teachers "in the right principles the wrong way." With a hardy courage that can only inspire admiration, Dewey reminded progressive educators, once again and for the last time, that it is the right *method* of training that would form the character of teachers and not the subject matter or rules they were taught. Pursue the right methods, and the democratic society might yet be created; follow the "authoritarian principle," and education will be fit only to "pervert and destroy the foundations of a democratic society."[31] And so the quest for a method of institutionalizing the proper anti-institutional methods goes on.

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WILLIAM P. TRAVIS

International Trade Theory and the Trade Expansion Act of 1962

THE TRADE BILL before Congress will give the President power to make large reductions in our tariffs, especially on those products important in the trade of the United States and the Common Market, taken together. It has the wide and active support of both economists and liberals. In its recognition of the necessity for Western unity, and of the threat or challenge of the Common Market, the bill seems to combine hard-headed political realism with the idealism inherent in proposals to encourage foreign trade. It promises to spread equitably the costs as well as the benefits of freer trade through assistance to those whom greater imports may displace. In its broad outlines, then, the bill seems to be a rare piece of consistent and universally acceptable legislation.

Deeper analysis, drawing on recent work in the field of international trade, raises certain misgivings about the underlying principles of the proposals. The type of tariff reduction to be applied makes unnecessarily large the displacement that a given degree of meaningful trade expansion necessitates. The total amount of readjustment in any case is likely to be greater than the authors of the bill realize or admit. The bill makes a bugbear of the Common Market and may do more to divide than to unite the free world. Finally, there is no evidence that its effects will significantly increase American income or productivity. It is absolutely certain that it can do so only on the condition that large changes in economic structure and relative factor earnings both here and abroad take place.

Protection and the Structure of Foreign Trade

The classical theory of international trade and of the advantages

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of free trade implied that in general at least one of any pair of trading partners would specialize on certain lines of production in which it had an economic advantage. All industries, all types of economic activity, would not normally exist in every country under free trade. If they did, their existence would indicate that these countries did not differ much in basic economic characteristics, and that therefore trade was of marginal importance. If trade were potentially important for a country, the introduction of free trade would necessarily lead to the elimination of a large percentage of domestic industries and the transfer of their laborers to other lines.

The modern theory of trade, unlike the classical one, does not explicitly require that countries specialize in performing a small percentage of the world's total number of economic activities in order to reap appreciable benefits from international trade. In the modern theory, specialization is partly an empirical question; it depends on the factor and resource requirements of different products and on the endowments of different countries. The empirical analysis of the next section indicates that a high degree of specialization is in fact necessary for any significant gains from trade, so that the traditional and modern theories concur on this important point.

The more capital in the form of tools, instruments, buildings, stockpiles of unfinished goods and raw materials, education, and training which a worker can apply to a given task, the less the time required for completing his task. The more good land a farmer possesses, the greater will be his yearly output in return for a given amount of his care and labor. If one country can apply more units of land and capital to each unit of its labor than can another country, every commodity will cost it fewer units of labor to produce. This does not mean that the country will enjoy an export, or a comparative, advantage in every line, however, for the capital and land, being scarce commodities, demand a price for their services. This price, just as that of labor, enters into the cost of all goods. If a country has abundant and therefore cheap capital and land, but scarce and therefore expensive labor, relative to its trading partners, it will produce cheaply those goods which use comparatively large amounts of land and capital. It will produce at comparatively high cost those goods which use large amounts of labor for each unit of output.[1]

Some examples of capital-intensive industries are coke and products, electric light and power, petroleum refining, metal smelting and primary metals, industrial organic chemicals, synthetic rubber,

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metal rolling, cement, steel, paper pulp, and synthetic fibers. Each thousand dollars' worth of production in such industry requires a heavy capital investment in the form of buildings, plants, machinery, equipment, instruments, vehicles, and the like. It requires few man-years of time, however. Some industries, such as oil, sulphur, copper ore, and iron ore extraction, as well as many important branches of agriculture, require large inputs of land services and natural resources in addition to large amounts of capital per man-year. Examples of industries which use very little capital and land per man-year are those which make internal combustion engines, wood products, electric lamps, textiles, clothing, footwear, headwear, leather and rubber products, office supplies, musical instruments, toys, sporting goods, electric motors and generators, transistor radios, and so forth.[2]

The United States has far more capital per worker than does the rest of the world. In 1947 about $11,460 worth of capital equipment, in 1947 dollars, existed for each worker.[3] The French economy, one of the wealthiest aside from the American, had less than $3,000 of capital per worker in 1950.[4] The capital endowment of countries such as India and Pakistan may well be of the order of $400 or $500 per worker. The United States, moreover, clearly has much more arable land per capita than do most other countries.

Labor is therefore our scarce and consequently dear factor of production. The average wage in this country is about $2.80 an hour, which compares with one of $1.00 in the wealthiest European countries. Japan's wages are only a fraction of Europe's. This means that Japan, Hong Kong, India, Pakistan, and the other low-wage countries and, to a somewhat lesser extent, Europe can make highly labor-intensive products much more cheaply than the United States can. The United States, on the other hand, having abundant land and capital, can produce agricultural commodities, many types of raw materials, semimanufactures and capital-intensive manufactures much more cheaply than the rest of the world. In addition, the United States can produce, relatively cheaply, sophisticated, new, and rapidly changing products which require education and skill, which are an important form of capital as well.[5] It has been found, moreover, that American export industries pay systematically higher wages and salaries than do those industries competing with substantial amounts of imports.[6] This is because scientists, engineers, designers, technicians, managers, and executives are relatively more numerous in American export industries and

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because their salaries or wages are partly a return on the large amounts of capital their long and expensive training represent.

The theory of international trade thus predicts that a country with America's capital-labor endowment ratio will, under free trade, export products containing a high proportion of capital services to those of labor, and that it will import products with a low ratio. In this way such a country relieves, through trade, its shortage of one factor and its abundance of another. Trade restrictions such as tariffs, import quotas, and voluntary export quotas negotiated with foreigners, according to their severity, will stem this alleviation of labor scarcity. Complete trade restriction will prevent any trading of relative scarcities and surfeits of factors.

Curiously enough, it is possible for selective trade restrictions, applied in a certain way, actually to do worse than complete restriction, by causing a country to export the services of its abundant, and to import those of its scarce, factors. Raw materials, on the average, happen to use almost twice as much capital per unit of labor as does the whole manufacturing sector. The United States protects labor-intensive manufacturing but allows most raw materials to enter the country with little or no restrictions.[7] Goods which normally would enter in finished and therefore labor-intensive form actually enter mainly as capital-intensive raw materials, to be worked up in this country. We must pay for these goods with something, and so we export in return the relatively capital-intensive commodities we manufacture. Nonetheless, these on the average are less capital-intensive than the raw materials they purchase.[8] American commercial policy therefore induces the United States to export the services of its scarce labor in return for services of capital, which she possesses in relative abundance. The United States would actually be better off if she stopped importing *all* competitive goods than under her present commercial system, by which she discriminates against imports of competitive manufactures.

The Structure of Production under Free Trade

There are two elements in the theoretical superiority of a system of world free trade over one of restricted trade. Under free trade, there is only one market for each commodity, and so its price is everywhere the same, or else it differs from place to place only by the amount of intermediate transport costs. Tariffs and other restrictions break up the world market for goods and cause prices

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to diverge among them. Consumers buy less of those goods which tariffs have made more expensive, and accordingly they are worse off than before. Some goods in every market become cheaper because of the trade restrictions, and to this extent consumers gain back some of the satisfaction that higher import prices cost them. If America should trade freely with the rest of the world, the prices of her export commodities would rise while that of her import commodities would fall. It is easy to show that consumers are still better off under free trade because the two price effects do not fully offset each other. This example highlights the essential nature of the commodity market gains which free trade brings about. It is a net gain, composed of nearly offsetting gross changes.

The same type of gain occurs in the process of factor reallocation and factor-price adjustment which underlie the increase in productive efficiency which free trade brings about. Acording to economic theory, the earnings of each unit of a factor, such as land, are equal to the value of the total output, which would have to be foregone if that unit were not employed. The physical amount of production which would be subtracted from total output if one unit of a given factor were withdrawn is, under equilibrium, equal to that factor's real wage. This product, and therefore the real wage, decrease as more of the factor is combined with fixed quantities of the other factors. If a country's labor supply, say, increases, but the value of its capital stock and its amount of land remain constant, the real wage, and thus the income of each worker, will decline.

Free international trade increases a country's effective supply of its relatively scarce factors of production and decreases that of its relatively abundant ones. The previous section has shown how. It thus raises the real income of those who offer the abundant factors but decreases that of those who offer the scarce ones. Even though world income and therefore the typical country's income increase through the improved allocation of world resources and the division of world production which removing artificial barriers makes possible, some groups in each country will suffer lower incomes than those they enjoyed under protection.[9] Therefore, although national income will undoubtedy rise under free trade, the resulting redistribution of income will be of greater magnitude. The rise in total income is only a net gain, composed of much larger, nearly offsetting changes in the incomes of different groups. In the United States, for instance, the incomes of wage earners will fall while that of property owners and professional people will rise.

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The Administration is wrong in asserting that the potential benefits of its trade bill, in so far as that bill really does move toward freer trade, far outweigh the potential injury to any group. The opposite is certainly nearer to the truth.

Many feel that freer trade might also cause unemployment. The Administration has asserted that the employment effects of its bill (which does not propose anything like complete free trade) will be slight. It also asserts that the adjustment assistance which the bill provides will be adequate to meet their requirements, so that again no one will be hurt.

The Administration calculates that no more than 90,000 workers will be unemployed as a result of the new trade measures. This is a curious estimate and it would be useful to know on what assumptions they have proclaimed it. In a way, though, it reflects the recognition of a fundamental reason for concern over the domestic effects of increased trade. Each million dollars' worth of our exports and of our domestic raw material production competing with foreign raw materials hires many fewer workers than does a million dollars' worth of domestic manufacturing production competing with foreign manufactures. Reducing the tariffs will increase imports of labor-intensive manufactures and reduce imports of the crude and capital-intensive materials which their domestic substitutes require. Tariff reductions will also stimulate exports of the more capital-intensive kinds of manufactures, and of food and raw materials as well. Suppose that both net imports and exports expand by one billion dollars. Suppose that the amount of value added per man in the domestic production which imports have displaced is equal to $5,000, while the same ratio for the increased exports is equal to $10,000. The increased exports will demand 100,000 workers, but the displaced import-competing industries will have released twice that amount. Unless wages fall so that more labor is used throughout the economy, or unless sufficient new investment takes place to employ the surplus labor at prevailing capital-labor ratios, unemployment must surely occur. If there is no substitution of labor for capital, nor any increase in the total amount of capital over what there would have been regardless of the change in tariffs, since the numbers taken for illustration are realistic, each billion dollars of increased trade must displace some 100,000 workers. The Administration may assume that the increase in trade will be no more than one billion dollars in arriving at its estimate of 90,000 unemployed workers. If the increase in trade is

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so small, it is impossible to see how it could compensate the nation for the $500,000,000 of lost production which the unemployment entails.[10]

There is no reason, however, why the increase in trade should be of only one billion dollars, or why therefore the potential effect on employment should be limited to only 90,000 or 100,000 workers. United States foreign trade is equal to about $20 billion annually, or about 3 percent of its total income. It is plain that there is little specialization in production as between the United States and the rest of the world; of every commodity which its soil and climate will permit, the United States produces roughly the amount necessary to satisfy its own demands. Yet the classical trade doctrine indicates that a country must eliminate many industries if it is to gain from free trade. The modern trade doctrine comes to the same conclusion. The necessary specialization of course requires a substantial volume of trade.

In order to appreciate the magnitude of such trade, it is convenient to classify economic activities according to their vulnerability to foreign competition. Certain activities are impervious, because the goods or services they produce cannot be transported: the construction, municipal utilities, warehousing, local distribution, and other such industries provide examples. Certain other economic activities produce portable commodities and therefore they encounter foreign competition but can never be entirely displaced by it. These are activities based on specific resources, notably land in its several varieties. Agriculture and mining are the prime examples. Unless given natural resources are so expensive to exploit or so common throughout the world as to be valueless, the activities based on them will operate at some level wherever they are found. The remaining set of economic activities includes those which are highly vulnerable to foreign competition. They produce portable commodities or universally vendible services and require only the general allocable factors, labor and capital and portable raw materials, for their production. They can take place wherever transport facilities exist.

In 1947, 47.278 percent of America's active population worked in services, public utilities, and construction activities belonging to the first category of industries and in activities considered more or less impervious to foreign competition. In the second category of industries impossible to eliminate under any reasonable assumptions, agriculture employed 8.191 percent and mining 2.184 percent

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of the country's work force. Indeed, under free trade, employment in these sectors would undoubtedly increase by a considerable amount, because America has more arable land and natural resources per person than does the rest of the world, which nonetheless devotes to agriculture and mining about two-thirds of its work force. In 1947, 42.34 percent of American workers were in the potentially vulnerable industries belonging to the third category. Under universal and complete free trade, whether any one of such activities is performed in one country or another depends only on transport costs and the countries' relative endowments of capital and labor. If a country or region has cheap labor in abundance, it will perform the labor-intensive portion of these activities.

As it happens, the majority of the activities most vulnerable to foreign trade use large amounts of labor in proportion to capital. In the United States in 1947, the third category used only $6,200 worth of capital for each of its employees. This compares with $19,440 per man in agriculture, $13,240 per man in mining, and $14,710 in services, construction, etc., and with an average for the entire economy of $11,400 per man. Thirty-one percent of American workers were in industries of the third category, which in addition used less than $6,000 worth of capital per man. Ninety-six of the 192 sectors of the 1947 input-output table of the Bureau of Labor Statistics fell into this particular category. Only 4 percent of the labor force was employed in manufacturing industries, which used more capital per man than did the economy as a whole, and this 4 percent worked in only 22 of the 192 sectors.[11] Complete and universal free trade would carry away to foreign shores, therefore, a considerable proportion—probably more than half—of American manufacturing. America would then specialize on commodities with high requirements in land, skilled labor, and capital.

Free Trade and Foreign Investment

If factors of production are free to move among countries, the productive structures of these countries can more closely resemble one another than if only the services of the factors can move through international trade. The United States once allowed immigrants to come in freely, and the large influx of foreign labor helped establish many industries in this country. In fact, certain industries were simply transported—workers, capital, management, and all—from

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Europe to America. It is clear too that, were it not for trade restrictions, some of this migration of whole industries would not have taken place, since the foreign producers could have continued to supply the American market.

When only capital, through international investment, is allowed to move, the situation changes slightly. Tariffs on manufactures stimulate the migration of people, or of people and capital, by raising their earnings relative to that of land. But tariffs reduce, rather than stimulate, the migration of capital alone. If a government forbade its subjects either to go abroad or to import goods, it is obvious that no one would ever make a foreign investment, since he would have no way of receiving anything in exchange. If imports were permitted, the investor could receive payment in the form of imported goods, which he could either consume directly or sell for home products, even though he never visited the country in which he had placed his capital. As history has revealed, Americans prefer to remain at home except for brief periods of foreign travel or when foreign residence enhances their enjoying a substantial part of their wealth. This propensity to remain at home, natural to almost all peoples, and the restriction of trade are the main forces preventing Americans from investing more of their very considerable capital in the rest of the world. Our foreign investments are mainly in Canada and Latin America, where they aid in the extraction of low-duty raw materials and tropical produce. Only such products, given American tariff policy, afford a broad enough return stream to pay interest and dividends on, and eventually to repatriate, substantial amounts of capital.

President Kennedy strongly believes that lowering our tariffs will help stem what he regards as a disturbing outflow of American capital, particularly to Europe. He believes that American businessmen invest in Europe in order to produce their goods in a market protected by tariffs. The amount of such investment is self-limiting, however, because of the difficulty of exporting the capital equipment itself over the foreign tariff wall, because of the difficulty of importing a return on the investment over the American tariff wall, and because of the limited number of American businessmen who are willing to consume their profits abroad. The basic force causing American capital to flow abroad (its great abundance here and its shortage there) will operate with full force under complete and universal free trade. It is conceivable, simply in terms of the historical experience of Britain and France, that as much as a third

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or a half of our gross investment each year might go abroad. This might be equal to 30 or 40 billion dollars a year, or about 20 times our current foreign economic-aid expenditures.

The Trade Expansion Act of 1962

The most significant new element of the Trade Expansion Act of 1962 is its reliance on import barriers only as a last measure to combat injury. Under the Reciprocal Trade Agreements Act of 1934, about to expire, escape clauses and peril points set a bottom limit to any tariff reduction which would seriously threaten an American enterprise. As a result of those serious derogations, that Act and its various extensions have not really done much to increase American trade. If tariffs are not permitted to fall below existing disparities between foreign and domestic prices, their reduction to that point will have little effect in increasing imports. The reciprocal trade agreements began with the absurdly high duties of the Smoot-Hawley Tariff of 1930 and gradually reduced a fairly large number of them to levels at which further reductions would have begun to swell imports.[12] The new legislation, in giving the President authority to continue the reduction of duties, seeks other means than continued tariffs to stem domestic injury. The aim of this adjustment assistance is to aid resources in finding new employments in those activities which increased trade will stimulate.

It seems clear that under its bill the Administration contemplates much smaller adjustments than those which the previous section argued would attend the introduction of universal and complete free trade, but that it contemplates at the same time considerably greater gains. Adjustments may be smaller simply because the President, under the provisions of the Bill, may stop far short of universal free trade, because foreign governments can obviously do likewise, and because the emergence of significant displacement will obviously cause that to happen. Moreover, the President does not even have authority to eliminate, through tariff bargaining, duties on those labor-intensive manufactures which would be most affected under universal free trade. In any case, there is no way in which the smaller adjustments, which in practice will take place, can have greater beneficial effects than the large ones which would potentially take place if trade were liberated entirely.

In fact, the method of tariff reduction which the present bill contemplates ensures a very low ratio of benefit to displacement.

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The bill proposes to continue the curious feature of negotiated, sector-by-sector tariff reductions which the Reciprocal Trade Agreements Act provided. Under this process, a country bargains with another country, or set of countries, for the reduction of its tariff on a given product or category of products, in return for a reduction of its tariff on a product or category of products, not, in general, the same one. This method of tariff reduction may have made some sense in the depression, when the Reciprocal Trade Agreements Act was passed. The Smoot-Hawley Tariff Act was passed to cut off imports and to protect the jobs of American workers who competed with foreign products. Foreign countries, also suffering from unemployment, promptly retaliated and our export workers began to lose their jobs. Reciprocal trade agreements were simply a way of ensuring that, when the tariffs were reduced, one country received as many new jobs as did its partners. Since there were large numbers of workers everywhere without work, it did not matter much which industries took on more workers and which lost them.

When full employment prevails throughout the world, as it does at the present time, it makes a great deal of difference which tariff or other restriction is reduced. In every fully employed economy, each industry competes with every other for its labor, land, capital, and intermediate products. The American textile industry must pay wages which bear a certain relationship to the wages which, say, the paper pulp, the automobile, and the heavy chemical industries pay. American trade restrictions raise the over-all wage which these industries, including textiles, must pay. The tariff on textile prodducts raises the gross revenue of the industry and enables it to pay its workers enough to keep them from going to other industries.

Moreover, the tariff works with a magnified effect on the income of each industry. A manufacturing industry simply transforms certain materials or products into different ones, adding value to them in the process. This added value is equal to the industry's income. From this income it must pay its workers, managers, and creditors. The typical manufacturing industry in the United States adds only about 30 percent of the total value of the final products it sells. About 55 percent of its purchases are manufactured commodities on which there are substantial tariffs. If an industry typical in this sense lost its tariff, which was equal, say, to 30 percent of the value of its final products, but none of the tariffs on its inputs were changed, the industry would have nothing left with which to pay its primary factors of production. If it no longer had to pay

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the tariff of its inputs, and if those tariffs were equal, say, to 15 percent, its income would rise by 50 percent.

If, therefore, a tariff bargain with another country has been struck by which a given industry in this country loses its tariff in return for a reduction of the tariff on the products of a different foreign industry, both the domestic industry and the foreign industry are likely to be eliminated. It is entirely possible in this process for each partner to lose an industry in which it would have a comparative advantage under free trade. If this is the case, the considerable adjustment which the reciprocal tariff reduction will have caused is worse than worthless.

The only form of tariff reduction that makes any sense, that is truly certain to lead to more good than harm, is one that reduces all tariffs by the same given proportion, preferably equal to one, of their before and forever-after levels. Only this method can ensure that activities enjoying a comparative advantage in trade will flourish, and that industries at a comparative disadvantage in trade will decline. Only this method can ensure, therefore, that the path toward free trade, if a country, or the world, wants to travel that path, will not be marked by the ebb and flow of resources, first in some, and later in other directions, among industries.

If the Trade Bill uses the worst form of tariff reduction, it also makes unnecessary special provisions regarding the European Economic Community. The Administration's thinking is almost as wrong on the economic nature of that entity as it is on the matter of tariffs and foreign investments. That thinking is predicated on these propositions: first, that the discrimination which the customs union implies will destroy markets for American producers; and second, that the free trade among Common Market members has increased their growth rates and will continue to do so. President Kennedy draws the conclusion from both these propositions that America cannot afford to remain entirely outside the Common Market.

It is generally said of the former of these propositions that the German producer, say, will have tariff-free access to the French market, say, for his products. The American producer, having still to pay a tariff on shipments of similar products, will lose sales he used to make to France and will suffer accordingly. He will, it is true, lose sales in France. But the German producer cannot simply increase his total production by an amount equal to the American's loss. He must reduce his shipments to other markets. If we take automobiles as an example, the Germans will sell more Volkswagons

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in France, and the French will sell more Peugeots in Germany, but fewer of both those makes of cars will be available for sale in Latin America, Canada, and the United States itself. If for any reason the Germans and the French decide to expand their automobile production at a greater rate than that at which their economies are growing, they must reduce other industries by withdrawing some of their factors. American exporters can be expected to fill the resulting gaps. The Common Market does not destroy trade, it merely diverts it, and may even increase it slightly. It cannot, therefore, harm American producers.[13]

The second proposition, which implies that the United States has merely to invoke the magic words "Common Market" to be transformed from a sluggishly growing, poorly performing country to a dynamic, young, and rapidly growing one, is equally false. The Common Market has not contributed any measurable amount to the growth of its member countries. Theoretically, there is very little reason to believe it should have. In their economic characteristics and relative-factor endowments, its members are nearly identical, and so free trade among them can be of only marginal significance. Indeed, the large German tariff reductions of 1956 and 1957, which brought her closer to free trade than she is presently under the Common Market, increased her national income by only 0.18 percent.[14] France, stagnant until 1954, began to grow rapidly thereafter in response to the heavy investments made ever since the end of the war under her comprehensive economic plans. Germany grew most rapidly in the 'fifties, and her rate of growth is now decreasing at precisely the time when, according to the Common Market explanation of growth, it should be increasing. Italy's economic resurgence, as that of France, clearly preceded the Common Market. Nothing to speak of has happened to the low Belgian growth rate, either before or after the Common Market. Economists have been unable to find a single economic indicator to show that the Common Market has affected the growth rate of any of its member countries.[15] The Common Market does not account for Europe's economic revival. The causality is just the opposite of what the President supposes: Europe's economic revival, especially that of France, has made the Common Market possible.

Foreign Trade and the Unity of the Free World

A special provision of the Trade Expansion Act would give the

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President authority to eliminate American tariffs on those products of which the United States and the Common Market provide 80 percent of world exports. Whatever the eventual membership of the Common Market, this provision will exclude the important labor-intensive products which the underdeveloped and labor-glutted economies of much of the rest of the world can hope to produce and sell abroad. Japan, which already has severely suffered from the discriminatory treatment of her trading rivals, will also be left out. Under this special provision, the products of these countries will meet stiff and discriminatory restrictions in the rich markets of the United States and Europe, the only markets which could afford to buy them in meaningful quantities.

The income-increasing effects of freer trade for the United States are unquestionably small.[16] Whether one deems them worth the large amount of readjustment which free trade would cause depends on his business or employment, if he consults only his own interests, and mainly on his predilections, if he consults those of the country as a whole. Under complete and universal free trade, we should have a larger and more prosperous rural economy, smaller and less crowded cities, fewer workers and more farmers, businessmen, and research scientists. Our economy would be closely tied, not primarily to Europe, but to the underdeveloped and capital-starved areas of the free world. It is they who would reap the greatest benefits. If they wished, they could be spared the wasteful effort of building heavy industry and modern capital-intensive agriculture, in which the United States actually has idle facilities. They could begin now to train their millions for manufacturing in which they will require much less capital for each increase in income. Free trade would cause private American capital to flow in abundance to those lands, and would direct this investment to the most lucrative projects.

Thus free trade is the means by which the poor nations might hope to increase their incomes to acceptable standards in the shortest period of time. Free trade would be far more effective in achieving this than any conceivable amount of direct foreign aid. Puerto Rico is an example of the role which free access to a rich market and its sources of private capital can play. Puerto Rico has not grown by exporting the products of her poor soil, but rather those of her rapidly improving workers. The rest of Latin America could do the same, but not under the present Trade Bill, nor under any scheme that will foster her losing trade in colonial products.

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Europe is obviously safe from all but the military threat of Communism. The same is not true of Japan, India, Africa, and Latin America. The Administration's scheme fails to open either Europe or America to the products which those areas must export in order to grow, or perhaps even to begin to grow. The basic unity of America and Europe in all the matters that really count is already firm. Now is the time to establish unity with the rest of the free world. All we have to do to begin is to lower *all* our tariffs. Free trade is very simple. The Trade Expansion Act of 1962 is neither sufficiently simple nor sufficiently well thought out.

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Language and Politics in India

OF THE MANY theoretical problems in the rapidly developing field of language and culture, the establishment of a common language for a multilingual state is probably fraught with the deepest political implications.* Linguistic unity may conduce to unity in other phases of culture; for example, the presence of an upper class speaking a fairly homogeneous dialect of English certainly increased the national integration of the Congress Party during India's struggle for independence. On the other hand, animosity of political or economic origin may attach itself to the palpable symbols of linguistic difference. Starving Indians in the industrial slums of Bombay have knifed each other "because" one speaks Marathi, the other Gujarati. India today provides an egregious case of linguistic diversity combined with weak chances for any one of the potential national languages. The salient point is that this weakness and diversity appear to be growing. Both the people of the culture and scientific observers consider the combination a disruptive "social problem" about which something should be done. As with food supply and population growth, difficulties are increasing more rapidly than solutions are being formulated or effected. In short, the situation is one of possibly tragic drift.

To examine the problem, we should first define some of the principal terms. "National state" means a fairly large population on a bounded territory, united by a standing government and bureaucracy, by economic organization, some shared customs and values, and most importantly, by a sense of self-identity as a body politic with a tradition. This definition fits India rather imperfectly, because

* This paper derives in part from linguistic research conducted in India during 1958-1959, under the auspices of the Rockefeller Program for South Asian languages. Thus it covers events up through August 1959.

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India is composed of numerous seminational states, each with its own dialects, ethnocentric prejudices, and distinctive profile. By "language" is meant a system of mutually intelligible vocal symbols by which the members of a society communicate. "Written language" is a special kind of language. "Dialect" is the speech system of a regionally or socially defined group, marked by a combination of shared linguistic features; such dialects may form a chain, so that speakers of widely separated links cannot understand one another.

In the anthropological sense, language is a part of culture, because it too is a historically derived system of conscious and subconscious patterns shared and transmitted by the members of a particular society. On the other hand, language is unique because it is a means of communication—in part as a code, in part as a symbolic organization of experience—that is interwoven in the most pervasive way with other cultural subsystems, such as that of politics. Every known society possesses a fully developed language, but many virtually lack other systems, such as music or politics. In addition language plays a singular role in the processes by which individuals and groups define themselves and are defined by others. The rise of nationalism in the modern period is often linked with questions of linguistic status and linguistic boundaries. A primary objective of this paper is to show how language is related to political dynamics in one particular country.

India, which now numbers over 400 million, is exceeded in population only by Communist China. Its social problems have increased in proportion to this quantitative change. Linguistic diversification also tends to increase with the social isolation of speech communities. Most Indians still live mainly in villages, cross-cut by hundreds of subcastes in patterns of sociolinguistic segmentation that have no close parallel elsewhere. Of these villagers, it is the women, linguistically the most conservative, who are responsible for the primary language influences on the children. Even the upper-caste child is often cared for by monolingual, lower-caste ayas. The leading novelist in Malayalam has grown wealthy by his writings and traveled widely in Europe and the Orient; but his wife does not speak English, and has only once gone farther than a mile from her husband's home and her nearby matrilineal household. The extensive migration and labor movement within India does not much counter narrow circumscriptions by caste and region. Linguistic homogeneity may be increased through the mass media, but most Indians have no radio, and are still infrequently exposed to

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movies or public broadcasts (though the latter are gaining influence).

The problem increases with the number of languages and their relative size and importance; thus Mexico's forty-odd Indian languages, spoken mainly by tiny minorities, do not threaten the national status of Spanish. India, on the contrary, recognizes fourteen languages for official purposes; all but three of them (Sanscrit, Assamese, and Kashmiri) are spoken by over ten million persons, and five are spoken by over 25 million (Telegu, Tamil, Hindi, Bengali, Marathi).[1] In addition, almost one-tenth of the population (32 million) speak dozens of other mother tongues belonging phylogenetically to four categories: Indo-European, such as Nepali; Dravidian, such as Tulu; Austroasiatic (Munda branch), such as Ho; and, fourth, a great number of "non-Indian" languages, notably English and Persian. *The Census of India* cites 24 tribal languages spoken by 100,000 or more, and 720 minor languages and dialects with less than 100,000; of the 63 non-Indian languages, English has the most mother-tongue speakers, with 171,742. At least six nonofficial languages are spoken by over one million, and two of these, Marwari and Sindhi, by only a few hundred thousand less than Assamese. The other big minority groups are, in millions: Santali, 2.8; Ghondi, 1.2; Bhili, 1.2; Mewari, 2; Jaipuri, 1.5.

The big official languages are absorbing the minority languages and also impeding the development of a national one; the Ho agriculturalist is learning a regional dialect of Hindi, but the Tulu is learning Kannada, while neither is learning English. Many who speak India's minority languages, especially the refugees from Pakistan, are now in various stages of transitional multilingualism marked by a reshuffling of dialects, considerable linguistic interference, and increasing submergence to the official languages. These minorities often resent the lack of official recognition; their case contrasts unfavorably with that of Rhaeto-Roman, a national language in Switzerland, although spoken by only one percent of the population.

The neglect of the minority languages on the part of the Indian government has further political implications. It is known pedagogically that children learn more rapidly and with less inner conflict if they first acquire literacy in their mother tongue. The present policy of immediate assimilation to the alien official language is bound to engender ambivalence and status conflict, for linguistic factors become inextricably enmeshed with political ones. India's

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sense of national unity might be reinforced by using minority languages in the elementary grades, by research into the geography of dialects and by the reconstruction of linguistic protohistory; but comparatively little is spent on such activities. This is not to mitigate the significance of the stop-gap government programs for intellectual exchanges between states, or the mushrooming interest in scientific linguistics, strongly supported by many universities, state governments and financial magnates.

Linguistic problems tend to emerge as a symbolic reflex of almost any other conflict. Many Indians feel that the so-called "linguistic question" is itself abnormal and counter to the ethos of their culture; people are hungry and anxious about getting employment and providing for their families, so they get exasperated by language differences. The necessity of struggling for jobs with persons of different speech communities intensifies economically based animosities. Naturally, the Communist Party of India has frequently exploited linguistic differences, since they weaken the Central Government and allow the Communists to identify themselves with "the people"; but the party line has varied greatly the last twenty years.

A spoken "natural" language is far more likely to attain national status, since the majority of a population is seldom sufficiently familiar with dead languages to make these immediately practical. But two extraordinary cases provide a contrary precedent. Hebrew, primarily a liturgical language for over 2000 years, was re-instituted politically by the Israeli state in 1948. At least three factors account for this and none of them obtains in India: first, the presence before 1948 of a Hebrew-speaking base population; second, the high literacy rate; third, the extraordinary patriotism bred of a profound sense of national mission, shared suffering under the Nazis, and a common Arab enemy of overwhelming numbers. Finally, modern Israeli Hebrew is strictly speaking a constructed dialect with a Biblical base and many recent accretions from other languages.[2] The second contrary case is presented by China. Written Chinese serves as a national code for the literate section of 618 million people speaking various dialects of at least seven mutually incomprehensible languages (for example, Cantonese, Peiping), as well as dozens of other Sinitic and non-Sinitic dialects. But special factors account for the vitality of the complex system of written ideographs: militant patriotism, the practicality of an existing supraregional language, the link to China's ancient, verbal culture, the esthetic and moral connotations of calligraphic training.

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Sanscrit is sacred to most Hindus. Since the Vedic hymns (c. 1500 B.C.) it has served in various related forms as a vehicle for metaphysics, the national epics, the laws of Manu, or the immortal poetry of Kalidasa. All literate Indians are more or less familiar with this spiritual lore and most revere it; orthodox Hindus know some by heart and may devote their declining years to reading and reciting aloud from the *Bhagavad Gita* and other repositories of wisdom. The grammarian who formulated the rules of Sanscrit over two thousand years ago today enjoys the status of a saint in the Hindu system. To a limited extent, written Sanscrit unites the educated Indians, especially the literati; hundreds of words and phrases are comprehended from the Indian Ocean to the Himalayas, and a much smaller scatter of items are understood even by those who cannot read.

The case of Sanscrit, however, while analogous to Hebrew and written Chinese, differs significantly on many counts. India exhibits a degree of cultural pluralism that staggers the imagination. The Christians and the Muslims, who constitute about 15 per cent of the Indian population and up to half the population in the deep south, are sharply divided into innumerable subgroups. But they generally join to oppose Sanscrit. Even the Hindus are pitched against one another on the the Sanscrit question; numerous copies of the sacred *Ramayana* epic have been publicly burnt by lower-caste organizations because of a racist interpretation of the dark-skinned monkeys in the text. Many Tamil intellectuals will not even consider studying Sanscrit because of its "Aryan" connotations. Hatred of the Brahmins because of their economic and political role is often linked with animosity toward Sanscrit, as in Bengal, Maharashtra, or Mysore. In addition, only a tiny subculture is really conversant with the language, and only a few thousand, centered in the Sanscrit colleges, can communicate freely using its complex inflections and luxuriant vocabulary. Since the great majority of Indians are still illiterate even in their mother-tongue, it would seem a purely scholastic fantasy to suggest making Sanscrit *the* national language. Nevertheless, an influential nation-wide society is devoted to the cause.

A language may be established feasibly in direct proportion to its structural distance from other languages which it will partially supplant. One of the more convincing arguments cited by Indians in favor of Hindi over English is the affinity of the former to other Indian languages. Most Indian languages share features such as

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distinctive aspiration, a series of retroflex sounds, four or more nominal case endings, considerable morphological synthesis, and syntactic patterns such as the modifier-modified order in phrasal attribution. These traits more or less unite them and, conversely, set them off from English. Recent testimony from schoolteachers indicates that Indian children learn Hindi almost twice as fast as they do English. Pan-Indian semantic categories may also account for this differential in speed.

But typological affinity can be a two-edged sword. Actually, minute differences can mobilize hostile sentiment almost as effectively as some typological abyss. Many Tamilian dialects lack the voiced, aspirate sounds, retroflex sibilants, and some other generally pan-Indian features. Tamilians, strongly opposed to the "imposition" of Hindi, may feel comparatively apprehensive about using Hindi in New Delhi precisely because of the absence or insignificant function of these subtle features in their own mother-tongue. And South Indian military history provides a striking analogy to the Biblical shibboleth, because many Tamilians found it impossible to pronounce in a satisfactory manner the retroflex, liquid nonocclusive phoneme in the speech of their medieval foe, the Malayali. On the other hand, prestige and power can overcome almost any degree of linguistic space. For example, the medieval Koreans discarded an eminently simple alphabet of twenty-five letters for the sake of writing Korean with the prestigious Chinese characters and to some extent for using Chinese itself for official purposes, despite the vast differences separating their language and Chinese in both spoken and written forms.

The foregoing considerations lead to what might be called the problem of the feasible degree of multilingualism. Just how many tongues can the average citizen be expected to control? Is multilingualism simply another type of lingualism or a qualitatively different phenomenon? Proficient, correct multilingualism on the part of individuals seems to be accompanied by a certain minimum of general intelligence, verbal aptitudes and code-switching ability. At the societal level, it usually involves special familial or subcultural patterns for inculcating vocabulary and automatic translation habits, as exemplified by the intelligentsia of Bombay, who often speak English, Marathi, Gujarati, Hindi, and sometimes Sanscrit, or those of the Polish Jewry, speaking Yiddish, German, Polish, Russian, and Hebrew, with high fluency in at least three out of five. Multilingualism appears to be especially workable between typologically and

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genetically close languages, such as Tamil and Malayalam, Marathi and Gujarati, or Danish, Swedish and Norwegian. On the other hand, widespread multilingualism between drastically different languages is rare—for example, the combination in much of Samarkand of Russian, Uzbek (a Turkic language) and Tadzhik (a variety of Persian). Many educated Malayalis in government service actually practice such an extraordinary range (e.g., Malayalam, Hindi, English, and Sanscrit), but their versatility can be explained through special schooling and career goals. All these aspects to the psychology of language learning suggest that one national or common language over and above the regional language might reasonably be considered the absolute maximum.

The basic fact remains that every member of every known culture speaks at least one language, but that no national state with full bilingualism—to say nothing of trilingualism—has ever existed. Thus, Switzerland, almost one-hundred-percent literate, deserves its illustrious reputation for language planning. But most Swiss villagers speaking French as their mother tongue are actually monolingual, and many educated Swiss know little Italian. Similar limitations to bilingualism may be adduced from other multilingual states, such as Paraguay (Spanish-Guarani), Canada (French-English), and the non-Russian republics of the U.S.S.R. Many Indians optimistically advocate a schedule of national trilingualism, combining the regional mother-tongue with some combination of Hindi, English, or Sanscrit. But India will eventually have to combine the mother tongues with Hindi *or* English *or* Sanscrit. Even then she will experience difficulties in maintaining adequate competency, and she will be constantly threatened by communication breakdowns.

The general level of literacy also determines the acceptance of any language for national purposes. The demonstrable fact that all languages are equally perfect symbolic systems (with respect to phonology and grammar), and are equally capable of expressing any denotative information, should not be confused with the equally demonstrable fact that illiterate masses, whether primitive, peasant or proletarian, are semantically hindered from playing a full role in the economic, social, and political life of a large nation. The presence of hundreds of botanical terms in some remote Hindi dialect does not mean that the speakers of it can make sense out of a governmental regulation. Educated Indians are passionately discussing what the average man—meaning the coolie, the peasant—wants to learn. But since the teeming masses are largely illiterate,

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even in their lower-caste dialects, the question of what second language they might want to learn is partly speculative, at least for the immediate future.

Some internal contradictions would be eliminated by focusing on the multilingualism to be promoted among the 100 million literates and the 15 million spiritual, political, and business leaders who must communicate between regions and nations. Politicians wax vociferous about the "common man" and hesitate to mention an "elite," partly because of the guilt and fear which they themselves feel about their own upper-caste status. Yet upper-caste leadership will probably endure for some time, irrespective of political transformations; the top leaders of even Kerala's well-known Communist Party are all Nayars or Brahmins. In the modern West the ideals of the "common man" and of mass education have led to policy about a language for the entire population of a national state. Such democratic vistas are realistic in comparatively educated countries, but they seem unwise and illusory in India.

Elitist considerations are connected with status anxiety in a second way: that "speakers imitate the habits of their superiors" is a fruitful if somewhat uncritically accepted assumption in sociolinguistics. A standard language may evolve from a dialect of great geographical dispersal, much of it rural, so long as it is sufficiently prestigious; literary Russian in the nineteenth century exemplifies this. Standard Malayalam has developed largely over the past forty years from the dialect of the socially and intellectually dominant (but largely rural) Nayar caste; here, as with Russian, the literary work of certain prolific and popular writers has played its influential role. But the standards of a language usually derive from urban dialects, such as Parisian French or New Delhi Hindi; indeed, the sheer density of population in the cities makes them foci for linguistic change.

Hindi falls short of the mark as a standard national language because it lacks sufficient prestige. The official figure of 160 million "Hindi" speakers actually includes a plethora of Hindustani, Urdu, Punjabi, and other dialects, mostly spoken by illiterate peasants and often having less affinity with one another than with the neighboring dialects of other languages. As one of India's most influential writers on the question of a national language puts it: "The fact is that Hindi is not even a good *regional* language. There is a lot of synthesis yet to be done among the dialects of Hindi."[3] Many southerners feel that the Hindustan area itself is backward and

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dirty and that New Delhi is comparatively corrupt. To the average Bengali intellectual, Hindi is a lingo of the bazaars, although more status is accorded to its standard forms. As Tagore wrote in a short story, "But the hard fact was that my little Hindi happened to be picked up from the porters and bearers and would scarcely enable me to enter into intelligent controversy with the Badraon princess."[4] In an analogous sense, Berliners would not accept Munich Bavarian as standard German.

To the educated person, especially a man of letters, the prestige of a language is inextricably associated with the literature in which the writers of the past have given expression to the genius of the tongue. Sparkling metaphors and sensitive characterizations can soften the resistance of proud minorities. For example, many Soviet citizens of minority states have eagerly learned Russian, the language of Pushkin and Tolstoy, despite their resentment of ethnic and political domination. English has also been appreciated in its own right by many Indian intellectuals; today Romantic poets such as Byron are more fondly read in India than anywhere in the English-speaking world. Shakespeare is widely read in the schools. Once I was interviewing a prominent Malayali novelist who has always despised grammar in general and Sanscrit grammar in particular. He alluded to the value of the "most unkindest." As I did not immediately grasp the reference, my Nayar companion chimed in, "You know, the famous Shakespearean cut."

According to an almost universal consensus, the foremost literary language of contemporary India is Bengali, above all because it was the vehicle and in part the creation of Rabindranath Tagore. The Tamilians, on the other hand, possess one of the longest unbroken literary traditions of any of the world's living languages.[5] During the fifth and sixth centuries syndicates of bards in the principal cities created a glorious romantic and devotional poetry, full of imagination and realistic perceptions, and largely free of the deadening influence of Sanscrit models. A high point in this literature is signified by the two thousand poems of the *Eight Anthologies,* attributed to the "Third Academy" of Madras. The medieval poetry of Tamilians such as Ramanuja still occupies a primary place in Hindu traditions. On the other hand, although some date Hindi as a literary language by the fourteenth-century poems of Kabir, there are many others who claim that "as the channel of the main stream of poetry it was established only with the beginning of this century."[6] Hindi does have a literature that includes well-known contemporary names

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such as Prem Chand. But objective and weighty criteria tend to rank it below at least Sanscrit, Tamil and Bengali. Certainly most Indians having non-Hindi mother-tongues would rank Hindi beneath at least one other Indian language as well as English.

For the same reasons there is a reaction today against the imposition of an "inferior" recent idiom. Rajagopalachari, speaking before a packed and cheering mass meeting in Calcutta in 1959, said, "The new Hindi, as it continues to develop, is not a language but a burlesque. Self-styled Hindi lexicographers and self-appointed Hindi purists have been competing with one another in evolving all manner of fantastic and unfamiliar words and phrases."[7] To quote another leader: "The strength of a language is as large or as poor as its literature. Precision and flexibility are essential for a language to be great and useful. It is well known that Hindi fails in these respects. The claim to greater political importance is absurd . . . if people speaking other languages prefer English and Sanscrit as furnishing greater knowledge, greater wisdom, greater enjoyment and greater continuity of enlightened life."[8]

Up to now the emphasis has been on the spontaneous acceptance of national languages. But they may be established also through political and military pressure; in Mexico the Spanish language was forced on the Indian population, linguist-friars following closely on the iron heel of the conquistador. The Russification of minorities in the U.S.S.R. has been consistently backed by the power of the central government—not to be confused with the linguistic sophistication of Soviet policies on nationalities. But prestige and power never guarantee permanency, since a shift in political hegemony can lead very rapidly to linguistic change. Persian has virtually disappeared from India since its heyday under the Moguls, and English may eventually go the same way.

Political power and the national language are uniquely interrelated in India. Hindi was voted in *de iure* by a congressional majority of only one during the wave of patriotic fervor and anti-British sentiment that swept the country in 1947. The main factors in this victory for the Hindi faction were the geographical extent and numerical plurality of Hindi speakers, and the location of the capital in Delhi (Hindi dialects extend approximately from the Western Punjab to Bihar, and from the Nepal border south to Andhra Pradesh). All over India people responded to the passionate appeals of Mahatma Gandhi and others by studying Hindi. Today, with a considerable change in public opinion, the Indian Central

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Government is faced with the predicament of insufficient power and will to carry through a program that has been legalized.

Various events reflect these contradictions. The nominally powerful Language Commission has issued pronouncements on complete Hindization by 1965. On the other hand, Chatterji, India's most distinguished linguist, has produced a widely read dissenting opinion that resulted in a reconsideration of the majority report in 1959 and the appointment of Chatterji as president of a Sanscrit Commission, presumably to weaken the "Hindi fanatics" through this indirect line of attack. Delhi is influenced by numerous extremists, many incapable of discussing the language question in a rational manner, whether they are linguists, journalists, or political leaders. Indian fighters for national independence from the British have subsequently been insulted on the public rostrum as traitors because they were standing against Hindi. Many of the Dravidians and Bengalis who occupy key roles in the Central Government are exerting their influence against Hindization. Non-Hindi adults all over India are passively resisting Hindi for all practical purposes by not taking any active steps to acquire it. A final example of inner conflict comes from the All-India Summer School for Linguistics held in Madras in 1959, twelve years after the Independence. About half the students favored Hindi, most North Indians passionately so. Nevertheless, fewer than one quarter could understand the Hindi speeches, and a public clash over the language question resulted in a social schism that ultimately affected most of the student body and some of the faculty. These disputants were linguists, supposedly enlightened as regards language. Some Indians say privately that they feel some dictatorial power is necessary to solve the language question, among others. But such power and the strategic vision to go with it are as yet absent.

Various fissures in India's culture may be growing rather than decreasing. One aspect of her linguistic pluralism has thrown into relief certain connections between language and politics. During British rule the political provinces almost never coincided completely with language boundaries. Thus Madras State included not only Tamilians but many people speaking Telegu, Malayalam, and Kannada, not to mention minority languages. The Bombay Presidency included speakers of at least four major languages. The principal result of this lack of congruence was that persons of differing speech communities were forced to interact and therefore to apply the principles of intergroup tolerance that underlie so much of

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Indian life. Second, English tended to emerge almost automatically as the *lingua franca,* in politics especially. English enjoyed a comparatively neutral status, since it was for the most part the prerogative of a supraregional elite, members of which are often scattered over many states in a network of subcastes, reaping the benefits as political mediators and leaders. They usually control some combination of Dravidian languages, or Indic languages, and English; one fairly representative Mysore Brahmin knows Kannada, Tamil, Telegu, English, and some Hindi (plus Kodaku, his childhood language). Many such polyglot intellectuals and administrators have opposed the organization of "linguistic states," believing that the public support was basically the reflex of a provincial chauvinism that would rapidly accelerate the introversion of India's culture areas. But against this fading intelligentsia stand the lower-caste leaders, rising rapidly in the democratic atmosphere, and more prone to incite the largely monolingual, voting masses by exploiting symbols of linguistic difference.

Gandhi and his followers had already harnessed linguistic self-determination to the Independence movement. This opened a veritable Pandora's box with which Nehru and others have not been able to cope very successfully. In 1948 the Linguistic Provinces Commission, appointed in the same year, stressed in its annual report the dangers of narrow regionalism. But by 1953 the Central Government had to organize the first "linguistic state" of Andhra (Telegu-speaking), after ceding to tremendous pressures that were climaxed by serious riots organized by the Communists after the fast to death of a Gandhian leader in Andhra—one of the first little whirlwinds of "passive resistance" that the Congress Party may continue to reap in the future. A States Reorganization Commission was appointed in 1954, submitted its report the following year, and recommendations began to go into effect after 1 November 1955. Despite various cautions and qualifications, it could be said that the cause of linguistic autonomy had won the day: the number of states was cut to fourteen, or one-half the original number, plus six centrally administered territories.

Since the "reorganization of linguistic states," the feared consequences have indeed followed with great rapidity. English instruction has weakened, notably in greater Hindustan. The partial maintenance of standards is limited to non-Hindi areas, since it was stimulated by reaction against Hindi. The Hindi program has almost come to a standstill in some southern areas. More and more

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states are instituting their regional languages; in 1959 the Mysore universities went over to Kannada; almost all instruction at all levels in Uttar Pradesh, including Delhi, is or soon will be in Hindi. This is the academic side of India's more generalized and largely regional self-discovery that continues to be a profound national experience, leading at best to what might be called "constructive nativism," as in the resynthesis of areal dance forms, but coupled at its worst with provincial bigotry and cultural discrimination. Leaders have played increasingly on linguistic prejudices against intrusive job-seekers from other states, leading indirectly to ramifications of a more serious character. Thus great numbers of (mainly Nayar) officials, expelled from Madras after the "reorganization," had to return to their native Kerala. The consequent piling-up of ambitious and frustrated leaders in Kerala significantly influenced the Communist victory in the elections of 1957 (won through Nayar support), and also the defeat of the Communists in 1959 (after the Nayars withdrew their support).

The "reorganization of linguistic states" has raised a series of additional long-range problems. First, on a per-capita basis the little states such as Assam (five million) are drowned out by Hindi-speaking aggregates such as Uttar Pradesh. Second, a political drift aptly called "the balkanization of the South and the consolidation of the North"[9] has been set in motion. Specifically, each of the four southern, Dravidian states is turning more to its own language—Tamil, Telegu, Kannada, or Malayalam. On the other hand, the huge Hindi-speaking states (Uttar Pradesh with 63 million; Bihar with 38 million, Madhya Pradesh with 26 million) are becoming consolidated and tend to be joined politically by other states where Hindi is either spoken also or easily learned (Punjab, Rajastan, Jamnu and Kashmir, and Bombay).

The combined process of balkanization and consolidation rests in part on a logical *non sequitur* that has been conveniently overlooked by politically interested persons. The comparatively tenable principle of "one language for each state" (because of efficiency in administration, and so forth) does not mean that one must create a single state or an arbitrarily small number of states for each language. One leader has suggested a plan for breaking up the great northern states into two or three smaller units each, centered around large cities serving as new regional capitals. As things stand at present, however, the organization of "linguistic states" has exacerbated the question of a national language while at the same

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time it makes some of the reasonable solutions less likely of success.

Finally, the principle of linguistic autonomy has proved unfeasible in Bombay and the Punjab because of the intense antagonism and inextricable intermingling of speech communities of commensurate strength; the Sikhs have been agitating with characteristic vigor for the official recognition of their writing system. The close juxtaposition of linguistic minorities does not necessarily produce fusion, despite the heat and friction of the urban industrial pot; thousands of caste groups living in diaspora in the big Indian cities have retained their mother tongue, endogamy, and religious practices for hundreds of years, in accordance with the deep-lying values that support social segregation, combined with various types of social interdependence. In 1958, for example, I took part in a "test for dialect distance" between a Marathi and the member of a Marathi subcaste whose ancestors moved down into Andhra over six hundred years ago. India's multilingual cities, notably Bombay, would provide excellent laboratories for the study of linguistic interference.[10] Such interference, however, might be found to differ markedly from the same process in other parts of the world, where the tendency to form colonies and "quarters" is not reinforced by the values of a pervasive caste system (admittedly, there are some parallels in the Near East). The extreme "ghetto-ization" of India's cities means that urbanization and industrialization are not as favorable to the development of linguistic uniformity as is usually the case.

Perhaps the most compelling force for the spontaneous adoption of a language is its relation to political values. In some cases a speech community may lack such a political substructure and may be segmented into two or more political bodies (e.g., the linked dialects of Austria, German Switzerland, East Germany, West Germany, and Holland). Or a state with more or less homogeneous political values may lack a single national code; thus the German in Switzerland is closer to Swiss French with respect to a partly covert system of political meanings than it is to Berlin German. But as a usual rule national and linguistic boundaries tend to coincide; indeed, these two domains of culture may powerfully reinforce each other's development. India's linguistic pluralism, on the other hand, is paralleled by a political disjointedness that has largely the same causes. She was never united before the British conquest; even the Mauryan and Guptan dynasties brought together only various portions of the country, and a consciousness of "national unity under Akbar" is

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vague indeed in the Dravidian South. A superstratum of British legal and political ideas, while genuinely espoused by many Indians, still lacks much in the way of integration with the various regional cultures. Also, any state or national government remains threatened by the possibility of massive mob action and the self-directed aggression of Indian "passive resistance."

What is the relation of the English language to Indian political values? Contrary to a widespread impression, the British followed a rather enlightened policy, without explicitly "imposing" their tongue. As early as 1832, however, they were seeking to produce individuals who would be Indian in blood, but English in opinion, morals, and intellect. During the late nineteenth century an anglicizing fashion swept upper-caste India because of the political and economic advantages of English, or because of ethnic shame (e.g., about nakedness, polygyny), and in part because of the intellectual appeal of English culture. An extensive system of nonprogressive schools achieved high proficiency in English through a combination of memorization by rote and active use in the classroom.

Today many Indians fully appreciate the advantages of this "window to the outside world." The regional languages themselves have become suitable for higher instruction only because of the new European learning. The languages of the mass media reflect public attitudes; over 1,000,000 copies of English-language newspapers are sold daily, in contrast to fewer than 400,000 in Hindi. English enables Indians to attend international conferences with "dignity" (meaning elegance, sophistication). Even the Communist intellectuals are grateful for the "English language experience," which has brought them translations of Tolstoy and Gorky. But all these patterns are ironically counteracted by certain feelings. During a recent convention Malayalam writers were bitterly accused of "knowing all about world literature but completely ignoring their Tamil neighbors." Some Malayali defended themselves by blaming "the British yoke" for their ignorance. But both the accusation and the defense were couched in the language of Byron.

Above all the practical and logical advantages stands the unforgettable association with British rule. The great majority of Indians, from the illiterate *harijan* to the cultivated polyglot, feel that the national language must be Indian and not the flat, denotative code imported by a people who, despite their democracy and their Shakespeare, were primarily conquerors, imperialists, and exploiters of

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the native land. After one hundred and fifty years, less than two million Indians speak English (more have some smatterings). Powerful, informal pressures affect many Indians who prefer English to their regional languages; a brilliant Tamilian poet of my acquaintance is frequently made to feel uneasy by his fellows because English is the language "of his excitement." And bitter indeed is the psychological predicament of the young Anglicized Indian who can speak only English. "It is doing violence to the manhood and especially to the womanhood of India to encourage our boys and girls to think that an entry into polite society is impossible without a knowledge of English. It is too humiliating a thought to be bearable."[11] Thus we see a negative value decisively influencing India's political destiny.

In conclusion: some Indians feel that the least harmful way out of the present difficulty might be an improved education in the regional languages and also in Hindi and English (selected according to circumstances), combined with a general attitude of tolerance and patience. Pressurized programs could stir up nativistic reactions beyond government control. Multilingualism itself should be regarded as a goal and a form of knowledge. It is hoped that language skills will continue to develop and be tried out in an experimental spirit, with leeway for the spontaneous drift of personality and culture. During the interim English might be explicitly rejected as a national language, while continuing in the status of an existing code, useful for national and international purposes. It would certainly accord with the Indian traditions of tolerance and religious reverence for "The Word" to adopt as a motto for the present: "Speak and let speak!"

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1. The states are (with the population in millions as of the 1951 census, and the language, in parentheses): Andhra (31, Telegu); Assam (5, Assamese); W. Bengali (26, Bengali); Bihar (38, Hindi); Bombay (46, Marathi and Gujarati); Madhya Pradesh (26, Hindi); Madras (29, Tamil); Orissa (14, Oriya); Punjab (16, Punjabi, Hindi); Uttar Pradesh (63, Hindi); Rajastan (15, Rajastan, Hindi); Jamnu and Kashmir (4, Kashmiri, Urdu); Mysore (19, Kannada); Kerala (14, Malayalam). Note that five states are all or mainly Hindi-speaking. Telegu and Kannada, Malayalam and Tamil form two sets of closely related Dravidian languages. Most of the Indic languages listed are also very closely related, about as far from one another as the Scandinavian languages. Bengali has about 80 million

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speakers if we count the community in Pakistan. S. Sarkar, *Hindustani Yearbook* (Calcutta, 1959), pp. 402-407.

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DAVID HAWKINS

Design for a Mind

SPINOZA LONG AGO observed that no one had ever been able to show what it is that a machine cannot do. We have come a long way from the clockwork automata of the seventeenth and eighteenth centuries, and we have come some distance in understanding the logic of a possibility argument. In spite of both kinds of progress, the debate over machines that think is not much advanced.

There are two sorts of categorial difficulties in talking about machines that think—that is, difficulties that could be called philosophical. One of these is related to our way of classifying material things —the logical tree of nature. This tree is constructed to serve rather general purposes of analogical reasoning. The greater the logical distance between two objects classified in this scheme, the more restricted is the set of questions we can hopefully pursue about one of them, through analogizing with the better-known traits of the other. A broken bone is more generic than a broken spirit: to treat the former, we might well begin by analogizing from a broken longbow, while with the latter the grounds of analogy would be much narrower.

The other categorial difficulty is the one that allowed Descartes to draw the line between men and the other animals, according to which the latter are complex automata, whereas men are something more. This is the division to which Spinoza was objecting. The nature of men, highlighted by our special interest in them, introduces into the tree of nature a distinguishing trait of a peculiar kind which Aristotle called rationality. Perhaps he found no difficulty in this differentia. Others did, and by the end of the nineteenth century it was possible to write a long account of the bifurcation of nature that philosophers had created or revealed. This was a variation on the even older idea of the split between soul and body, but it was a good deal more thoroughgoing.

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Machines as Natural Species

The hypothetical species of thinking machines—*Machina cogitans*—raises my second categorial problem, that of mind and body, in an apparently very stark form. On reflection, however, one sees that the dualism of mind and body does not of itself provide any argument against the existence of *Machina cogitans*. For such an argument applies also against the existence of another species, *Homo sapiens*, who nevertheless does exist. A dualist is already committed to the proposition that the human organism does not think, except in the equivocal sense of its being affiliated with a thinking psyche. The same equivocation must be allowed by the dualist in discussing the possibility of *Machina cogitans*. A dualistic argument against thinking machines must manage to be an argument to the effect that machines are not the *sort* of things that can have psychic affiliations.

A monist, one who denies the ultimacy of the distinction between mind and body, has the same problem in a different form. For him it is unequivocally correct to say that the human organism thinks, so he must show that a machine cannot function in the way the organism can. Panpsychists, who believe that every material thing exists also in the psychic dimension, might be expected to be friendly to the idea of a thinking machine, but they would trivialize the idea in the act of accepting it. Perhaps a typewriter or a drill press has a bit of psyche about it and therefore cogitates a bit. But to say that such a machine thinks is to broaden the meaning of the word so far that it has no bite. What is true of everything distinguishes nothing.

Thus one sees that the mind-body problem is not the pivotal one in the discussion of thinking machines. The pivotal problem, for all schools of thought, is the first one I named. It is how we are to classify machines in the logical tree of nature or, in other words, how we are to define them. The definition must exclude animal organisms because otherwise the argument goes by default. On the other hand, it must exclude typewriters, drill presses, and even today's computers, because otherwise the argument is silly. It must locate the thinking machine, in the tree of nature, at a very respectable distance from man. For it is clearly the great categorial distance between the two species that causes the trouble we face. The analogy of thought is literally far-fetched. But before we try to locate *M. cogitans*, we have to examine a prior objection, which is that machines do not belong in the tree of nature at all.

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Aristotle contrasts nature and art, the artifact have only an external *telos,* not being able, as it were, to take off and do things on its own except in terms of its natural components. Thus a wooden bed might sprout root or leaf if it got buried, but it would not make another bed. I think Aristotle captures something here that is important. Still, John von Neumann proved that self-reproducing machines can exist, and that demonstration goes directly against Aristotle's particular argument. Yet even without von Neumann, all our machines today are partially the products of self-reproduction. Machines are never merely man-made. Every machine is essentially a variation on an earlier working model, and it takes hundreds or thousands of machine generations to get from a skyrocket, say, to an Atlas. Thus we can make an evolutionary taxonomy of machines, as species that evolve in the soil of human culture. The artist is no longer the sole creator, if indeed he ever was. He is not a demiurge, but an agent of variation and selection. What he does is better and faster than generic variation and natural selection, but the principle is the same.

I do not want to eliminate the distinction between the natural and the artificial; but a modern machine, which has its own internal motive power and guidance, simply pulls the Aristotelian distinction out of its original shape. An automatic factory makes its own artifacts, and a factory that copies itself more than meets Aristotle's conditions for inclusion in the tree of nature. The description of the evolution of material culture cannot remain restricted to the sharp dichotomy of user and use, of artificer and artifact, without becoming trivial. For both man and nature have been transformed by this evolution.

The Animate and the Inanimate

The machine is now naturalized. Its naturalization is confirmed, I would add, by the complaint so characteristic of our present culture, according to which machines take over and man is alienated. We could hardly take this view if we saw machines, steadily, as mere artifacts of men. Even so, the branch created for them is in many respects distant from that of man and his animal cousins. The importance of this fact deserves more analysis. If we classify with respect to n independent attributes, we get 2^n categories. Whether you look at Aristotle or at more modern versions of the tree, however, you see a different kind of structure, using interlocked rather

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than independent traits for differentiation. Vegetative things are classified with respect to sensation and locomotion, as are animal things; but the box is left blank that could be labeled "nonvegetative, but locomotive and sensitive." *Machina cogitans* can be connected to the rest of the tree only by our going against an entrenched logical habit, which is to think of differentiating traits as being well-defined only with respect to the genus which they differentiate. For this reason, a thinking machine seems almost as incongruous as a portable equation, a green logarithm, or an unhappy molecule. The habit is moreover a reasonable one. A classification by completely independent traits would make analogical reasoning fruitless, whereas even the most common-sense versions of the tree of nature constitute a kind of synopsis of cumulative experience.

In all versions of the tree of nature, from the most primitive to the most sophisticated, the distinction between the animate and the inanimate marks one of the grand divisions. Animistic thinking, whatever its importance in the history of human cultures, is not a counter-example to what I intend. Animism overrides or blurs the distinction in some contexts and for some purposes, but it also presupposes it. With *anima* are associated differentiation and development, discrimination and self-motion. Associated with these in turn is a special kind of organization in structure and function. The words are hard to define, but they cluster together in our usage. I shall attempt a sharper kind of definition. It is obvious, in the meantime, that any analogizing between the human and the inanimate must cross a long, long bridge. The length of the bridge was more obvious to Aristotle than to a primitive animist, and it is still more obvious to us, for we can measure it by the time scale of evolution.

As a preliminary to the discussion of biological organization, I would like to carry the discussion of art and nature one step farther. I have argued that machines, although products of art, have a place in the tree of nature. Here I would add (this time with Aristotle and tradition on my side) that in the biological realm nature acts as if by art. Life is contagious, it remakes the inanimate world in its own image. But to breathe life into the inanimate is to give it the form of life. In the older meanings of the words, "to inform" might mean "to inspire." A Stoic writer spoke of Nature as a clever artisan who, using fire as we use our gross hands, could fashion the tiniest parts of living things.

The concepts of organization and function, which are relevant to the investigation of our problem, are inseparably connected with

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this idea of nature's art. Biologists (and, oddly, psychologists) try to avoid vitalism by hiding the teleological connotation of these concepts, but it is of their essence. To be alive is to have been inspired, to have been informed with the form of a living thing, and nature is indeed a clever artisan. In what follows I shall try to spell out the meaning of organization and of nature's art in acceptably scientific terms.

The Thermodynamics of Life

In order to face up to the problem of complexity and organization, we have to abstract in such a way that living things exemplify this complexity without being necessarily the only species having it. Aristotle made an effort to do this, and so did Hobbes and Spinoza, the last named in Book II of the *Ethics*. Today we have a new intellectual framework within which to make the attempt, and with it a new dimension to add to the map of nature. We can classify the things of nature by size or mass, by characteristic times, but also by a thermodynamic measure of organization. Thermodynamics is an austere and abstract discipline which philosophers of science, with few exceptions, have largely ignored. Yet it provides part of the common framework within which men and machines can both be described, and which, though doubtless inadequate to the purpose in many ways, is not negligible.

The relevant thermodynamic theorem was first demonstrated by Leo Szilard in 1929.[1] This theorem had to do with the old problem of the Maxwell Demon, who allegedly could, through the exercise of intelligence, cause heat to flow uphill and bring about a perpetual-motion machine of the second kind, in violation of the Second Law. Szilard showed that, in order to gain the information necessary to exploit the thermal energy of the molecules, the Demon must dissipate at least as much free energy as he harvests from his knowledge. So he must have an external supply of power, as must any other heat engine.

In classical and quantum statistical thermodynamics, one deals with macroscopic systems described in terms of a finite number of alternative micro-states, arbitrary in number for the classical case and fixed in the quantum case. Thus one deals with the molecules in a box, described in terms of the positions and motions of each molecule at a moment in time. Under some appropriate description of the boundary conditions, one can assign a probability to each

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alternative micro-state of the system, the probability of its being in that state on any specific occasion. The entropy of the system is a statistical average of a special kind. One calculates the negative logarithms of each probability and then finds the average value of these logarithms, using the probabilities themselves as weights in the averaging. Multiplying this average by a physical constant called the Boltzmann constant, one has a measure in physical units, of ergs per degree Kelvin. When all the probabilities are equal, this entropy measure is a maximum. Maximum entropy implies a maximum lack of predictability and therefore the complete unavailability of the energies involved to do external work. Minimum entropy implies the opposite. Whenever one deals with a system which is itself composed of several subsystems, a correct statement of the boundary conditions normally includes the statistical independence of states in one subsystem from those of the others. This means that the probability for each subsystem to be in a specified state is the product of the separate probabilities, and the corresponding entropies are additive. The entropy of two systems together is thus the sum of their separate entropies. In such cases entropy appears to be an independent property, like mass in classical physics.

The Maxwell Demon problem, however, envisages just the situation in which two systems (the gas in a box, say, and the detailed description of the state of the gas that the Demon records) become micro-statistically coupled, so that, to the extent that the state of one system is defined, the probabilities for different states in the other are altered and so, therefore, is the entropy measure relative to these boundary conditions. In such circumstances, entropy is no longer additive but sub-additive: the entropy of the whole system is less than the sum of the separate entropies of the parts. In the extreme case, we can imagine a system of two parts each of which, considered separately, has the same maximum entropy but the entropy of the whole is the same as that of either part considered separately. The state of each part then defines or requires the state of the other.

The concept of sub-additive entropy is relatively unfamiliar, but it can be expressed roughly by the more familiar statisticians' measures of association or correlation. If we can predict something about the microscopic state of one system by examining that of another, we say they are correlated. Sub-additive entropies are the expression of correlations that have been induced among the microscopic variables, normally independent, which statistical thermodynamics

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deals with. Still another mode of expression, which I shall use later, appeals to visual intuition. Many persons today are familiar with the scatter diagrams of correlation, as, for example, of points on a graph representing the correlation of weight and height. The closer the correlation, the more nearly will the points lie on a diagonal line. When many dimensions of comparison are involved, we imagine a similar situation in a many-dimensional graph, or phase space. Suppose that the phase space has 2N dimensions, N to describe the state of each of two subsystems. If there is a perfect correlation between the two subsystems, or a minimum entropy of one relative to the other, then all the points representing the state of the total system will lie on a diagonal hyperplane of N dimensions, whereas each subsystem, looked at separately, may have its possible states spread out uniformly in a condition of maximum entropy.

An added meaning was given the entropy measure by the Information Theory, first developed by Claude Shannon. This theory shows that the entropy of a system relative to given statistical boundary conditions, when left as a pure number without the Boltzmann factor, is at the same time the expected number of binary (or *e*-nary, depending on the logarithm used) discriminations required to give a complete definition of the micro-state of the system, when the best possible procedure for arriving at a sure decision is employed. Because of Shannon's work, we have a clear definition of the quantity of information, equivalent in logical structure to a score in the old game of "Twenty Questions." We propose a series of questions, and nature answers each with a "yes" or "no." After a long enough series of such answers, nature has told us the precise state of the system being investigated. The number of questions and answers (the score in the game) is the amount of information needed to achieve the goal of complete definition.

When multiplied by kT, the Boltzmann constant times the temperature, the information measure has the physical meaning of an information *cost*, the price being kT units of free energy per unit of information. In a complete transaction, we buy information at a price at least this great (paying out, for example, in chemical potential) and sell it at a price at most this great. This is why the Maxwell Demon will not work, he cannot buy the information he needs cheaply enough to make a profit, and he goes out of business. In a closed system such as Maxwell assumed, there can be simply no profit. In an open system, however, the information exchanged may gain us the control of other free energies that nature provides.

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These are frequently so great that the exchange of information can run at a loss and still provide a large profit from the appropriation which it makes possible.

As is true of any form of heat engine which we wish to construct, there is a practical upper limit to the efficiency of a self-informing heat engine, depending on the details of its operation. Neverthless, there exist in nature highly efficient engines of this type, namely, living things. They extract free energy from the environment of sunlight, and guide it to the performance of the work involved in living and reproducing. This is nature's art. And the Stoic writer was correct in the contrast he made between man's art and nature's. If we take fire as the symbol of chemical free energy, nature's art is different from man's because, in its use of fire, it is microscopically subtle. In our temperature milieu, reasonable thermodynamic efficiencies are possible, in the guidance of the flow of things, only for control units which are molecular in size. Even an electronic computer, with control units like transistors weighing milligrams, is fantastically inefficient. It may well be, however, that we shall escape from these limitations. There have been investigations of techniques of micro-miniaturization which could build circuits with ten billion triode tubes per cubic centimeter. This achievement would be competitive in efficiency with the animal nervous system. Human art might then seriously compete with nature's. Only I think it would be wrong to speak of competition here, for surely human art is part of nature's art, evolved through man.

Our vague intuitive idea of organizational complexity can be rendered in terms of thermodynamic measures either as mutual negative entropy or as mutual free energy. Such measures lead to a general conception of organization, in the sense of mutual requiredness among the parts of a system possessing specified sorts of stability; and such measures give some idea of the amount of organization which the various biological systems entail. The smallest bacteriophage requires for its reproduction only a few hundred or thousand bits of differential information, while man might require ten or a hundred billion. I say differential information, because the number of alternatives which have to be eliminated is a function of the milieu, and the phage, for example, has to pirate substances which it could not itself possibly synthesize. Man also is a pirate of the rest of the terrestrial environment: it would cost more, for example, for him to reproduce himself on the Moon.

The characteristic use of biological free energy is not of course

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to raise weights but to control other free energies that are quantitatively greater than those degraded in the control process. These energies may in turn go into the further storage of information, and so on. Molecular copying is the basic unitary process, but the complete picture is more complex, involving a chemical cycle in which the copied molecules catalyze a chain of reactions which in the end put into the environment of those molecules the very ingredients for their own further self-duplication. This biological cycle is stable against the background of thermal and chemical noise only because of its constant external supply of power.

Information Cycles

I wish to introduce here a formal but simple terminology having to do with such stationary cyclic processes. If a process is cyclic, returning after a time to an initial state defined in terms of relevant variables, we may divide it into two arbitrary phases, each one of which is a *mapping*, and is also the mapping inverse to the other. If we think in these terms, we are led to say that the biological unit is not a molecule but a self-mapping process or cycle.

In this sense I want to introduce the word *copy*, not at all as synonymous with *mapping*, but in terms of cyclic mapping: I want to say that one part of the cycle *copies* the other part merely in the sense that it is the inverse mapping. In this sense you could say that one part of a planet's orbit copies the rest of it, although the case is uninteresting thermodynamically, for the system is not metastable but is, so to speak, in the lowest accessible energy state.

The copy concept is thus dynamical rather than structural; but copying in biology involves the reproduction of identical structures which are copies of each other in a derivative sense, namely, as way stages in a copying process. The simplest living things involve two such cycles, one the direct reproduction of the chromosomes and the other the more varied process by which the relevant molecular units for reproduction are concentrated in the environment. In the first cycle each structure becomes a copy of the other, while in the second the chromosomes copy the environment—that is, they catalyze specific processes which invert the spontaneous transformations going on in the system and thus make a cycle.

A Copying Unit

I am practicing this language of mapping in biology because I

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want to transfer it to neurophysiology. The simplest neurological analogue is a cycle with signals rather than with ambulatory molecules. The simplest neurological function involves a reverberatory cycle which maps into itself and in which again one part copies the rest in inverse transformation. Figure 1 shows a little box with two

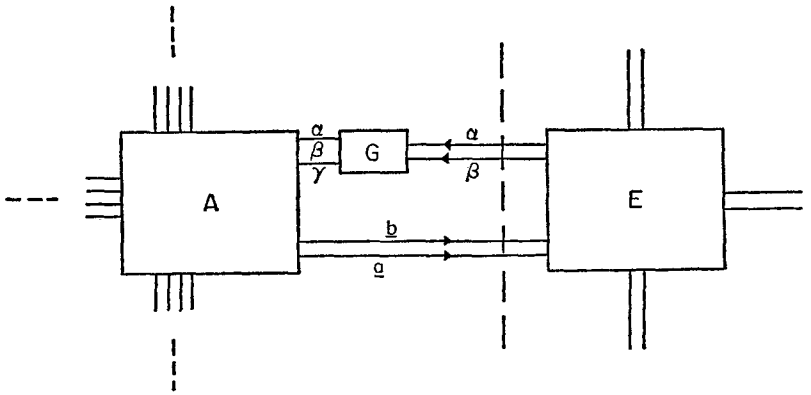

Figure 1. A copying mechanism. A is the associator, E the environment, and G the gate. E is defined by a → α, b → β. The associator maps (α, β) into (a, b) statistically. γ is the blocked response from E.

possible output signals, *a* and *b*, to an environment. This environment maps *a* into an input signal, its response, which is α; and it maps *b* into an input signal which is β. The box in turn maps α into *a* and β into *b*, and there is a cycle.

What is interesting about the box, and reminds us of the thermodynamic underpinnings, is that the response was not designed but learned by the box. If the environment had responded differently, signaling β in response to *a* and α in response to *b*, the box would have acquired the complementary habit, of responding to α with a *b* and to β with an *a*. The initial response of the box was random, *a* or *b* with a probability of one-half. But, as the box acquired a history, the probabilities changed. Its working is easy to understand.

The box has a gate on its input circuit, which can be in one of three states, admitting only the signal α, only the signal β, or admitting either signal indifferently. The passage of an α signal puts the gate in the state which will pass only another α, and the passage of a β puts it in the state to pass only another β. After a time delay, if no signals are received by the box, the gate reverts to the neutral state. The three responses of the box have been labeled α, β, and γ,

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the last for the blocked response. The circuitry in the box is designed so that a signal which gets through to it from the environment increases the probability of its repeating its previous signal to the environment, while the blocked signal (the γ state) causes that probability to regress toward one-half.

The unit described is not very bright, and a sufficiently variable environment will confuse it. But it will copy a monotonous environment, and it is simple. Its practical behavior depends critically on the choice of parameters governing the acquisition and erasure of information. If the erasure rate is too fast or too slow compared to the acquisition rate, the box will get trapped by its own necessary noise, by random fluctuations. If there is noise in the environment, the learning rate will slow down for this reason. But my design is only a paradigm, so I leave these questions aside.

The copying unit can be designed, of course, for more alternatives, and thus for a more complex environment. There is also the possibility that a box can be part of the environment of another box, so that what the latter maps can be altered by the acquired mapping of the former. Thus two boxes in parallel could map alternative environments, and a third, with these two in its environment, could acquire and maintain a steady reverberation to the combination of one-off-and-one-on—a learned ignoring of the difference between the two environments. With time delays, such a third box could resonate steadily to a rhythmic alternation of the two environments.

When I look at my pen, I suppse there is an efferent signal to the environment (in this case to the eye muscles), which serves to maintain the incoming pen signal. If a different efferent signal goes out, shifting the eye, the afferent signal is promptly replaced by some alternative, as a cup or book, a signal in turn maintained through some duration of time. The object perceived is thus improperly described as stimulus, as autonomous signal. More properly, it is a response to my probing, and still more properly, it is a mapping of some variety of test signals which I transmit. And my perception is not properly a response, but an inverse mapping.

A System of Copying Units

One now can visualize a much larger system, composed of very many boxes arranged in very many concentric circles or shells. The afferent circuits from outer to inner are many-one, while the efferent circuits from inner to outer are one-many. There is one additional

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type of unit involved in this circuitry, a gate which opens or closes, depending on the match or mismatch between afferent and efferent signals. This involves a sort of figure-eight reverberation, in which an inverse mapping of the environment in a peripheral unit is itself mapped in a more central unit. Thus a gate could stay closed to signals toward the deeper center, when a unit in the second layer was matching, by its output, the input from the environment: inattention to the clock is implied, for example, *unless* it stops ticking.

A part of the environment is motor, and afferent signals not only get little responses from the environment but also big ones, changes in the way the environment maps little signals. The machine alters its own environment. The basic concept throughout is the one-many-many-one character of the mapping. An outer system of optical units resonates, say, to a tomato, and would do so equally to a cat, or a volume of Darwin. An open gate to units farther in produces a differential response which sends back a matching stereotype; then *Machina cogitans* ignores the tomato, strokes the cat, or opens the volume of Darwin. The complexity of afferent signals is reduced by each layer it penetrates, and therefore we can say it classifies *per genus et differentiam*. The complexity of efferent signals is increased at each layer as more units are activated, producing selectively those complex signals to the environment which will sustain steady reverberatory cycles, including a cyclic switching of cycles, etc., some of very long period.

So far I have left out of the design anything resembling a function of affectivity. I have done this to combat the tradition of behavioral investigation, according to which all learning involves drive and drive reduction. *M. cogitans* copies its environment, not to eat and not for love, but just to copy. There is, however, a general schedule for self-maintenance and self-protection. If we represent the variety of the environment by one phase space and that of *M. cogitans* by another, then the copying process native to the latter will tend to move the combined systems into a hyperplane of the product space which maps each subspace into the other, as macrocosm and microcosm. But there are regions of this hyperplane in which *M. cogitans* fails to survive, even though, so to say, it describes its own demise. The schedule of self-maintenance involves built-in responses of reinforcement and erasure, so that the representative point will move away from regions of danger and tend to stay in those of prosperity. These built-in responses are primitive in a double sense: they must be built in, and they are unsubtle. But

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learning will subtilize them, as it does in all the higher animals.

Mind as Mirror

My design is not meant as an application for a patent but as an appeal for attention to a problem, and I hope I may be forgiven some of the sketchiness in describing it. The problem may be stated as follows: *M. cogitans* as described so far might be capable of very complex and highly teleological behavior—if coupled to more primitive quasi-biological cycles, it might manage to feed itself and in general get along in the world. It might also, in the more Platonic dimension, manage to become a very complex and subtle *speculum mundi*. As far as I can see, however, it would remain metaphysically unenlightening. The question then becomes: what is missing *in the design*? I can imagine having a kind of communication with it through a specialized circuitry, and I can imagine persons giving it a proper name, even, perhaps with a certain embarrassment, addressing it as Thou. People already do this with quite stupid computers, not to mention automobiles. However, that fact is obviously less of a comment about machines than about human mythopoeic capacity, that amiable waywardness in our make-up without which perhaps this whole discussion might be impossible.

I think I see a little way into the problem, and that suggests my closing discussion. *M. cogitans* has some comparability with living things under thermodynamic categories. It copies the world about it and so manages to persevere in a steady state. It is a super-homeostat; it does not just get knocked about by the environment; it takes account of the environment and even reorganizes it. The world is reflected in it and, in terms of Hindu idealism, it has soul —the reflection of the Rose in a glass. Or, in Spinoza's language, it has a body fit for many things and therefore has a mind, the greater part of which is eternal.[2] I find all this a troubling sort of comparison, however, and mention it only to suggest that I have not missed the boat completely, having come within range of *some* traditions of metaphysical psychology.

The troubling thing is that *M. cogitans* up to this point is either cycling along in a quite steady state, or else it is learning in only the most primitive trial-and-error fashion. In the first case, it seems to me to be an automaton in the usual metaphysically pejorative sense; and in the second, it is evolutionary but not intelligent. In fact, anyone with a little experience in the game will recognize that

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the time scale for *M. cogitans* to learn anything interesting is distressingly long. We can remedy this lag by building in some general stereotypes of a spatial and temporal order, for example, and of number. In this way we can restrict and thus channel the stochastic scatter of responses when reverberatory cycles are blocked and when, by this standard, the machine is ignorant. We could also build in other very general patterns of response, for example, an instruction to probe for temporally irreversible and contiguous correlations. Another instruction would go to defining the laws, the functional constants, of the environment.

At this point, it may be recognized that the machine designer is turning Kantian and supplying something like the *a priori* forms and categories of Kant's metaphysic of experience. There is no doubt that a machine so equipped, with *a priori* search routines, could acquire information from the environment immeasurably faster than one not so equipped. We would in effect have eliminated a substantial part of the redundancy of the input from nature by making use of our own knowledge of nature. This is fine, but it does not diminish the sense of automatism in the finished product; rather, it merely puts a heavier burden on the human designer.

Mind as Self-Consciousness

The real trouble, I think, lies in the contrast between the tranquil state of reverberation and the Monte Carlo method of learning, however cleverly directed by machine design. This brings me back to the concept of gating. A gate that opens only on the occasion of a mismatch between afferent and efferent signals is a gate that admits what may properly be called sensory *novelty*. This opening may be a signal to activate other already well-established reverberations, so that other gates farther toward the center remain closed. The novelty is one that is relative to one pattern of information, but not to a more comprehensive pattern.

There is a frontier of novelty, however, beyond which no reverberatory copying of the environment has been established. My hunch is that everything within the domain of our discussion, everything of traditional philosophical interest, is connected with this category of novelty. As a mode of human experience, not as a philosophical muddle, self-consciousness is a phase of experience at one end of a scale, the other not being consciousness of something other than self, but immediacy, automatism—unopened gates.

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Our human careers, considered as we consider them along the way in planning and in revery, are defined by phases of self-conscious experience. During such phases we construct ends and accept them as our own, we face difficulties and describe ourselves as facing them. We learn, and what we learn is manifested not only in altered and subtilized behavior, but also is known *as* knowledge. In the graph of our histories these phases of self-consciousness are nodes connected smoothly by phases of relatively unself-conscious existence, of immediacy approaching automatism. The contrast is between reverberatory states and periods of transition, and it is in the latter that the categories of mind are operative. That *Machina cogitans* should be able to learn and think as we externally describe those activities is not enough. Unless the machine itself can respond *to* the activities, categorizing them within its own mentalistic categories, our whole discussion of the thinking machine is little more than the elaboration of a pun. To *Machina cogitans*, as described so far, I need to add a new and still more central component.

Such a system is defined by a new kind of gate. I have described two so far: the first is the gate which every copying unit involves, open to a repetition, and closed to a variation of incoming signals. The second kind of gate is one that closes when certain afferent and efferent signals match, and opens only when they do not. The third kind of gate is an evolution of the second, which couples the now postulated deeper layer to outer layers, in a way that competes with the demands of the primary environment. It copies the information of the outer layers, but it also responds to the matching and mismatching that goes on in those layers. Novelty and routine are objective characters of its environment, and it builds up stable responses to them qua novelty or qua routine. The monitoring signals, which map the operation of outer gates, are again tied in to a native cycle of self-maintenance. Ways of copying the outer automaton are reinforced, if they re-establish a reverberatory equilibrium between the latter and the primary environment.

To the routine of self-maintenance for the flesh, discussed above, we are adding a higher affectivity, which will reinforce exploratory activity and the acceptance of its fruit. As pleasure and pain act at the level of self-maintenance, so the higher affectivities signalize what is well or ill in the career of our minds. Without speaking in these human terms, I will nevertheless describe *M. cogitans* as committed, above and beyond the call of survival, to a kind of self-enlargement.

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This inner component, gated off or encapsulated in its normal functioning, is highly combinatorial in function. It will split and lump, it will define hippogriffs as well as more ordinary beasts, and it will reorganize the play-back from memory, it will tell little stories, and sometimes big ones. It will set up reverberatory models of *its* environment without the reinforcement or inhibition of the primary environment. It will work with the automaton's simplified mappings of that environment; in terms of these mappings alone, moreover, some of these secondary reverberatory cycles will get stabilized and others not. Of those that get stabilized, some will be incoherent with the detail of the primary environment, so that they only get stabilized, and recorded, in protective isolation. The general principle of stability is the same as before—a many-one-one-many iterative mapping made possible by redundancies in the quasi-environment. I am going to call this whole mode of functioning—working behind closed gates, detached or encapsulated—by the term *intensionality. M. cogitans* constructs models of its environment, and of itself in relation to that environment, which differ in varying degrees and sometimes differ radically from what actually goes on in the primary phase.

Finally, there are going to be transient interactions between the primary phase and the intensional phase. Gates will open so that information from the primary environment will excite reverberations previously built up in the intensional phase; and efferent responses will occur which are not just random, as in the simplest kinds of trial-and-error learning, but which are pre-informed. They will still have a noise component, however; what will be changed is that now the incoherent response will be categorized *as* incoherent, and the coherent response *as* coherent, in both cases by the test of an already established intensional coherency. Learning time is reduced, and newly informed overt behavior changes its patterns more radically than mere trial and error would allow. Among the stories told, there finally arise some called, "How to Solve It," stories that could be told only after many passages of interaction between the intensional and the primary phase, and only by reference to a category of novelty. My account is intended to suggest some of the classic analyses of thinking, associated with the names of William James, Charles Pierce and John Dewey.

There is yet another emphasis possible: it is that gates get opened not because of a mismatch between afferent signals from the environment and the standard anticipations of these signals; they open

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rather because activity in the intensional phase leaks out of its capsule and alters the character of the signals. This kind of interaction between the two phases implies that *M. cogitans* can get itself into trouble. The novelty is then not in the primary environment but in *M. cogitans*. *M. cogitans* becomes for itself a source of novelty, a novelty not in the mappings but in the inverse mappings. Again, the result is on occasion a radically altered interaction with the primary environment.

Consciousness as a Way of Being

Such is my artifact, my myth for the machine age. Some of its elements I am sure are sound, and the over-all image, I believe, has a kind of verisimilitude. There are, I know, many embarrassing questions, and some may lead to the discovery of incoherencies or embarrassments, like the detailed anatomy of the hippogriff. My descriptive language, beyond the minimum formalities, inverse mappings, and gates, is still heavy with the equivocation which a patent-minded designer will have to avoid. In spite of this, I have not talked about mind, consciousness. One meaning of mind causes no trouble, I think. It is the sort of meaning which we associate with Spinoza's *intellectus*, or what Dewey called objective mind. It is simply the objective order of things, *sub specie aeternitatis*. *M. cogitans* copies the order of things, and itself in relation to that order. Hence, as I said, in Spinoza's language it is a body fit for many things, and it is a mind, some part of which is eternal. But what of Dewey's subjective mind, with respect to which situations can be problematic, or that phase of mind in Spinoza's account, one which may have ideas that are mutilated and confused?

The suggestion latent in my myth is that the meaning of subjectivity, in the objectivistic context to which we are limited, is connected with transitions involving transfers of information between the two phases of activity which I have called the primary and the intensional, and so with the fact of novelty. These are the transfers which we call learning and choice. Human self-consciousness is consciousness in its most emphatic and analyzable form, and it is, I take it, that mode of experience in which we deal with novelty, whether in our description of nature or in the planning of our own behavior. I cannot overtly describe *M. cogitans* as self-consciously engaged. I cannot, because I am working by analogy, analogy within the thermodynamic tree. If the human organism thinks in the equivo-

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cal sense that a human being thinks and that a human being is an organism, then I claim the same speculative possibility for *M. cogitans*. A dualist sees in man a cross-categorial mystery, but he has no philosophical ground for denying the same mystery to *M. cogitans*. A monist sees in man a physical marvel, but he likewise has no philosophical ground for restricting the marvel to a single natural species. And he must grant the *prima facie* dualism that gives rise to the mind-body problem in the first place. The language of self-consciousness contains essentially intersubjective terms which are as incoherent with the language of human physiology and overt behavior as they are with the language in which I have designed the machine. We describe our physical environment and our own bodies from a point of view which is not, then and there, either a part or an offstage continuation of what we are describing. The intersubjective language, the language of intensionality or consciousness, is tied to a categorial scheme different from, although richly cross-referenced to, the scheme of naturalistic categories.

It is this duality for which I have tried to prepare *M. cogitans*. In so hasty a sketch I have not had time to single out the analogue of the cycle of voice and ear, surely a necessity both for his cogitation and for coupling to his kind, or to ours. If, so equipped, *M. cogitans* should ever come to be evolved, humanly rather than biologically, it would be as a dualist in manner and style, whether or not by philosophical conviction. His existence would settle nothing either for him or for us, although we might discuss matters with him. Then, perhaps, we might be ready to admit that consciousness or intensionality is not a problem at all but a category, a way of being, not a problem but a topic profoundly associated with novelty and, therefore, a topic in all the most interesting conversations.

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WILLIAM DRAY

Some Causal Accounts of the American Civil War

PHILOSOPHERS of history have often been criticized by historians for theorizing about historical inquiry in a way, and at a level, which fails to make contact with what is actually going on in the historical field. In this paper we are concerned with the philosophical problem of the nature of causal judgment when it concerns a historical subject. I hope to throw light on this problem chiefly by drawing attention to some things historians themselves have said, both in making causal judgments and in talking about them. To keep the discussion manageable, I shall concentrate on a single, but exhaustively studied, causal situation: the coming of the American Civil War in 1861.

When historians reflect on their own causal accounts of this event, what seems principally to puzzle and embarrass them is the apparently irreducible variability of their conclusions.[1] These vary not only from period to period but also from historian to historian at roughly the same time. Cushing Strout, a historian with theoretical interests, who has wrestled with the so-called problem of historical "relativism,"[2] describes the situation in these terms: "A spectre haunts American historians—the concept of causality. After nearly a hundred years of passionate and dispassionate enquiry into 'the causes of the Civil War,' the debate is still inconclusive." What is even more discouraging, "twentieth-century historians often merely go back to interpretations advanced by partisans while the war was still in progress."[3] Kenneth Stampp, the editor of a recent anthology entitled *The Causes of the Civil War* and author of an important history of the outbreak, expresses a similar and quite typical concern. "As one reflects upon the problem of causation," he writes, "it becomes perfectly evident that historians will never know, objectively and with mathematical precision, what caused

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the Civil War. Working with human behaviour, and finding it impossible to isolate one historical factor to test its significance apart from all others, historians must necessarily be somewhat tentative and diffident in drawing their conclusions."[4]

Now Stampp's and Strout's remarks surely make a large assumption: that the problem, although irritating, is essentially one concerning the difficulty of applying or practicing historical method. It seems to be taken for granted that causal analysis in history is in concept and intent a value-neutral sort of enquiry which ought, under favorable conditions, to yield identical conclusions for all competent investigators. Actual differences in conclusions are consequently attributed to failures on the part of particular historians—to lapses into illicit partisanship, or to lack of information about the state of affairs under study which might possibly have been obtained through experiment. The considerations advanced in this paper count against this very common assumption. They suggest that the very concept of causation employed by historians is such that no attempt at mere "fairness," or increase of mere "information," would guarantee agreement by investigators with different standards of value. The situation is not just that historians sometimes in fact allow their causal judgments to be swayed or diverted by irrelevant value considerations. It is rather that, in quite standard cases, the concepts of value and of historical causation are not logically separable.[5] And, of course, historians can be depended on to disagree about values.

A survey of rival accounts of the American Civil War would, I believe, amply justify such a claim. Since such accounts are legion, however, and this paper is necessarily short, I shall limit myself to what seem to me to be three interestingly different stages in the development of dominant interpretations during the century of dispute intervening since the event.[6] The first is the so-called "conspiracy" theory, which had its heyday during and immediately after the war itself, but which has made something of a comeback in recent years. The second, which in some form or other seems to have held the field from roughly the 1890's to the 1930's, I shall call the "conflict" theory, echoing the well-known phrase of W. H. Seward, "the irrepressible conflict." The third, which appeared in the mid-1930's and is still being actively debated, I shall (following the practice of historians themselves) call "revisionist." To sum up the historiography of the Civil War and its causes in three such simple stages, of course, amounts to a great oversimplification. Yet

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it does reflect actual trends, and it will provide sufficient material for present analytical purposes.

Now even among historians disagreeing sharply about the causes of the Civil War, it must be recognized that there is usually a substantial amount of agreement about what is relevant to a full-scale *understanding* of it. In almost all cases, for example, there will be mentioned a series of incidents such as the Supreme Court decision on the Dred Scott case, John Brown's raid on Harper's Ferry, or the election of Lincoln in 1860 on a minority vote. Attention will also be drawn to various standing conditions such as the antislavery agitation in the North, pressure for re-opening the slave trade in the South, quarrelling over enforcement of the fugitive slave law, growing economic tensions between industrialists and planters maneuvering for political control of the Democratic Party, and so on—not to mention the character, opportunities and actions of prominent public figures like Seward and Davis, Lincoln and Douglas. All these and a host of other relevant items will normally be woven into a coherent and predominantly narrative account of how the Civil War came to break out, and sometimes without any explicit causal judgments being registered. In spite of their frequent protestations to the contrary, however, historians almost always, sooner or later, single out certain acts, events, or circumstances from the narrative as a whole, as being causes of the coming of the war.[7] It is in the discrimination of such crucial or especially important factors, I shall argue, that the historian's value judgment becomes an ingredient in his causal findings.

The three theories of Civil War causation already mentioned all involve discriminations of this kind. The first, the conspiracy theory, as the name suggests, selects as cause the actions of certain individuals and groups—the "conspirators." It was a popular theory, both during the war itself and during the reconstruction period, not only with avowed propagandists or sensation-seeking journalists, but with serious-minded (if self-taught) historians like Bancroft, Lunt, and Jefferson Davis. When we ask who the conspirators were, however, the value judgment implicit in their selection immediately shows itself in a significant split along sectional lines. To Southern historians they were Northern abolitionists, out to eradicate the South's "peculiar institution" by the only method possible: the violation of constitutional guarantees after the capture of the federal government; or they were "Black Republican" politicians

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determined to make use of the slavery issue to achieve control of the federal government. To Northerners the villains were the planters and their political allies—the "slave-ocracy"—determined to protect slavery by ensuring its spread to the territories, and perhaps ultimately to all the states. As the contemporary historian, Bancroft, put it, "leading Southern politicians" had engaged "for over a quarter century in a conspiracy to disrupt the government which they could no longer control."[8] The time seemed to have come when it was necessary to determine by whom the Union was to be run.

Now what sort of dispute is this? There are certainly important nonevaluative points at issue. The case of each side, for example, depends upon the correctness of the attribution of certain motives to the alleged conspirators of the rival section. But even if sectional advocates reach agreement as to the motives and intentions of all the actors, the question remains whether it was the attempt, say, of the Northerners to eradicate slavery that caused the war, or the attempt of the Southerners to protect it. For the historians of the period, the choice between these possibilities rested on moral grounds: it was based on an appraisal of the reasonableness or degree of justification of the actions of each side; it depended on the answer given to the question: "Who was being aggressive, and who was simply defending his rights?" To Southerners, the secession of the South (even the firing on Sumter) was simply a warranted response to a Northern threat, and was not a cause of the war, even though it was a necessary step in bringing it about, and may even have initiated it. To Northerners, denying the constitutional right of secession and claiming legal possession of federal property in the states, the cause was Southern resistance to rightful occupation—the last act in a series expressing resistance to the idea of the Union. The concept of causation employed by such conspiracy theorists on either side is thus logically tied to the evaluation of those actions which are candidates for causal status. That the actions of either Black Republicans or the slaveholders and their allies were causes of the war is a judgment which requires the prior judgment that these same actions were reprehensible.

There is one form of the conspiracy theory, it should be noted, which escapes the implications of this analysis. It has been asserted by some Southern sympathizers, for example, that the actual outbreak of hostilities (if that is what we are trying to explain) was plotted by Lincoln himself, and achieved by sending the famous

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relief expedition to Fort Sumter. Lincoln knew, it is argued, that if a federal ship appeared in Charleston harbor, it would be fired on. He sent it so that it *would* be fired on, and thus the South would commit itself, not just to secession, but to war. In contesting this form of the conspiracy theory, Kenneth Stampp very properly concentrates entirely on the question of Lincoln's intentions; for the claim that Lincoln caused the war by his policy at Sumter could not be denied, if it could be established that he acted while knowing and intending this result. Stampp relieves Lincoln's intervention of causal status on the ground that the President's calculation was rather that his own position, previously weak, would be secured, whether the Confederate batteries opened fire or not.[9] If they did fire, he would have a united North behind him; and if they did not, the Confederacy would be weakened by failing to stand on its alleged sovereign rights.

If partisans of South or North disagree about Lincoln's motives and intentions, this may still be due to their evaluative commitments, in the sense that they are not in fact (although they should be) equally swayed by the same evidence. Nevertheless, the question of Lincoln's motivation can still be decided in principle, without the logical involvement of such an evaluation. Few of the conspiracy theorists, however, have gone so far as to attribute the Civil War to the deliberate plan or plot of certain agents. The supposed conspiracies were usually aimed at something short of war, and their role as causes, therefore, has to be established more subtly. This is done in the value-charged way already explained.

Following the first outburst of writing on the Civil War, mainly by apologists and partisans, there was a gradual shift of interpretation from conspiracy to what I have called "conflict" theories. Historians in both sections, especially in the North, tended to realize that there were two sides to the quarrel, and that an understanding of what happened required an adequate treatment of both. They therefore came to look with more sympathy on the motives and aims of their erstwhile opponents and to be more circumspect in allotting blame. As a result, the actions of the other side, or of its significant minorities, gradually lost causal status. The men of both sides came to be thought of, in a sense, as being trapped in a situation not entirely of their own making, one allowing them little room for maneuver. As Howard K. Beale puts it, they came to see the war "not as a conspiracy of one group but as a struggle between two groups with irreconcilable interests."[10] The cause was then sought

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in the situation itself—the conditions presenting such a difficult problem—rather than in the responses of the various actors to it.

Historians still differed, it should be noted, on the proper characterization of the problem situation; and their accounts, at any rate at first, tended once again to divide along sectional lines. Thus J. F. Rhodes, a Northern historian of the 'nineties, declares: "Of the American Civil War it may safely be asserted that there was a single cause, slavery . . . the whole dispute really hinged on the belief of the South that slavery was right and the belief of the majority of the North that it was wrong."[11] Rhodes does not, however, like most of his Northern predecessors, use his personal agreement with the Northern view to justify his attribution of causal status to the actions of the other side. The cause of the war was not the wrong-headed determination of the South to keep or extend the institution; the cause was not what anyone *did* about slavery; it was *the fact that it was there at all.* Slavery, according to Rhodes, was "the calamity of Southern men, not their crime."[12] The South was certainly mistaken; but Rhodes is far too conscious of wrongdoing on both sides to hinge a causal judgment on such a one-sided attribution of blame.

In the South, a whole generation of historians tended to agree with Jefferson Davis that the struggle was not essentially one between two moral codes but one between two schools of constitutional interpretation.[13] The North, for whatever reasons, had gradually lost sight of the concept of federal union animating the Constitution devised by the Fathers—a concept ensuring the highest degree of autonomy in the states, which in theory retained their sovereignty. Differences of economic and political interest in North and South were natural and unexceptional; and it was to make it possible for the two sections to live together in spite of these differences that the powers of the federal government were limited. Slavery was only one of a number of issues which brought this difference in the basic interpretation of the Union into question. For two groups with such irreconcilable constitutional views to continue in a single state was unthinkable; separation, in view of the same issue, was likewise impossible without war. Once again, although the historian in fact thinks one side in the dispute to be in the wrong, he deliberately excludes that moral judgment from his explanatory account. The consequent attempt to see the struggle in a detached way, and from both sides, again results in transferring the causal status from the actions to the situation itself.

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Now it may perhaps be thought that at this point—which is also the point at which we begin to hear about the "scientific" historiography of the Civil War[14]—historians succeed in separating their causal judgments from their value judgments altogether. I should want to argue, however, that the causal judgment is still in part evaluative; for it still selects one relevant factor—the problem situation—and rejects another—what the agents did in response to it; and this selection is presumably based on some criterion or principle. The conflict theorist selects the predicament itself as cause because he judges that no course of action that could reasonably have been expected from the men of either side would have succeeded in avoiding war. And the word "reasonable" which enters here is crucial to an understanding of what is being claimed. For the conflict theorist need not deny, for example, that the war could have been avoided by the North's abandoning the western territories to slavery, or by the South's capitulation to the demands of the Union government before the firing on Fort Sumter. He simply does not demand such heroic responses from ordinary human beings; he is less exacting in his standards than the conspiracy theorist. In locating the cause of the war in the fact that the problems facing the actors were "beyond them," he is guided nevertheless by moral considerations as surely as is the partisan of the conspiracy interpretation.

The only way to avoid such a conclusion would be to interpret the conflict theory as representing the problem situation as a *sufficient condition* of the Civil War—and the war itself, consequently as inevitable. It must be admitted that there has been a tendency in that direction among conflict theorists. With the rise of the trained historian in the late 1890's, and the great increase in the scope of historical interests, the account of the nature of the struggle has tended to broaden. Newer Southern historians like Wilson, for example, having disposed of the moral question by observing that both sides in the constitutional struggle were "right" from their own points of view, seek causes in the social and economic conditions which explain how each came to the point of view in question.[15] Northern historians like Turner and Channing also discover causes in the historical processes which had made the two sections so different.[16] By the end of World War I, the Beards were representing the war as a "triumph of industry over agriculture," and its cause as an economic conflict so basic that "the transfer of the issues from the forum to the field . . . was bound to come."[17] In

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1934 A. C. Cole further generalized the struggle by picturing "two different civilizations contesting, one for supremacy and the other for independence."[18] In so far as such accounts really mean that the war could not have been avoided by any means, given the nature of the conflict, then the element of value judgment in the causal conclusion has disappeared. Yet, in spite of what may seem to be the contrary implications of their language, few conflict theorists are really willing to be pushed to such a conclusion. As one of their most recent champions, Pieter Geyl, has put it: the problem of slavery, for the men of the time, was "overwhelming"; but this does not imply "that the war was inevitable, not even . . . in the ten years preceding the outbreak."[19]

In arguing that the selection of causes is partly evaluative, even in the case of historians offering apparently detached "conflict" interpretations, I shall doubtless be accused of reading more into their accounts than they intended. If so, it may be of interest to point out that this places me in the company of distinguished members of the historical profession. For the third sort of interpretation I wish to note is a reaction against the second on precisely the sort of ground which I have been sketching. The "revisionism" of the 1930's, exemplified in particular by the work of Avery Craven and J. G. Randall, loudly protests what it considers to be the moral flabbiness of the conflict theory. Its rival causal claims are advanced on the ground that historians must reassert human responsibility for what occurred, and must make clear the extent to which the Civil War was a "needless" one.

The willingness of the revisionists to apportion blame, however, does not signalize a return to the sectional type of partisanship. For moral judgment now cuts *across* sectional divisions and singles out guilty parties and groups on both sides of the quarrel (although there is admittedly a certain tendency—perhaps a compensatory one —to deal more harshly with the North). To the revisionists, the heroes are the exponents of compromise, on both sides of the line—men like Douglas and Buchanan. What overwhelmed them and brought on the tragedy was (in Randall's words) "emotional unreason and overbold leadership." "If one word or phrase were selected to account for the war." Randall writes, "that word would not be slavery, or economic grievance, or state rights, or diverse civilizations. It would have to be such a word as fanaticism (on both sides), misunderstanding, misrepresentation, or perhaps politics."[20] Craven assesses the situation in similar terms. The war, he

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says, was the work of "a generation of well-meaning Americans who . . . permitted their short-sighted politicians, their over-zealous editors and their pious reformers to emotionalize real and potential differences, and to conjure up distorted impressions of those who dwelt in other parts of the nation."[21]

As T. M. Bonner explains it, what the revisionists are reacting against is "a view which exposes human helplessness in a web of our own making."[22] They are very much aware of the fact that the concentration upon conflict as a cause implies that the war, although perhaps not inevitable, was still not something men could reasonably have been expected to avoid. The revisionists' abhorrence of war (to Randall it is "organized murder"[23]) was so great that they, by contrast, were willing to blame the actors for behaving in perfectly familiar and understandable ways—for failing, in other words, to rise to the occasion. The war, Craven insists, was not an "irrepressible conflict"; we could have expected something better from the protagonists; for "*it is the statesman's business* to compromise issues until a people have grown to higher levels where problems solve themselves."[24] The war, he insists, was "needless" and "avoidable." Because it *could* have been avoided, it *should* have been. Because it nevertheless occurred, we must look for its causes in the actions of those who failed to prevent it.

Critics of the revisionists, like A. M. Schlesinger, Jr., and Pieter Geyl, have scoffed at the naïveté which expects such a standard of rationality in human affairs. Surely by now, Geyl writes, we have given up the belief that man is "a sensible being"[25]—thereby suggesting (in spite of his own disclaimer) that, given such a conflict situation, war was inevitable after all. Revisionists have also, and more characteristically, been attacked for seeming to imply that only in an emotional frenzy could the majority of men have gone to war over the slavery issue. This, say their critics, reveals a failure of understanding. "By denying themselves insight into the moral dimensions of slavery," Schlesinger charges, "the revisionists denied themselves a historical understanding of the intensities that caused the crisis." "To reject the moral actuality of the Civil War," he continues "is to foreclose the possibility of an adequate account of its causes."[26]

One might, of course, interpret the latter criticism simply as charging that the revisionists failed correctly to interpret the motives, the rational calculations, of both sides—failed to see, for example, that the historical agents concerned might really have been acting

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for explicable moral reasons, rather than out of political calculation or an induced paroxysm of emotion. This might be thought to raise only nonevaluative issues concerning the interpretation of motives. In enlarging on the reasons for this alleged failure of understanding, however, the critics generally shift their ground. By such phrases as "the moral actuality of the Civil War," they mean to imply that North and South could not reasonably have been asked to compose their differences peacefully; they evince their conviction that there are certain things worth fighting for. "Because the revisionists felt no moral urgency themselves [regarding slavery]," writes Schlesinger, "they deplore as fanatics those who did, or brush aside their feelings as the artificial product of emotion and propaganda."[27] The situation in which the men of the 1860's found themselves, he continues, involved "moral differences too profound to be solved by compromise." A return to a version of the conflict theory is thus urged: the actions of both sides, because they were genuinely responses to what appeared as moral imperatives, are regarded as "forced" by something else—the unhappy situation itself. It is the latter, therefore, which is the cause. Whether revisionists or their critics are to be accepted as giving the better account of the causes of the Civil War is not the point at issue in this paper. Our problem is simply to see what, in differing about causation, they are really quarrelling about. What they are quarrelling about is surely the stand to be taken on a moral issue. That issue is whether war with one's fellow countrymen is a greater moral evil than acquiescence in political and economic domination, or in the continuance of an institution like chattel slavery.

If the foregoing examples of causal judgment in history are at all representative—and I think they are—it should now be clear why historians will never know "objectively" what caused the Civil War—why, in Stampp's words, "after a century of enormous effort the debate is still inconclusive." The reason lies in the concept of causation historians employ. They use the term "cause" in such a way that their value judgments are relevant to their causal conclusions—not just in the sense that they do in fact influence those conclusions, but in the sense that the conclusions are logically dependent on them. As long as "cause" is not to mean "sufficient condition," there must be some reason for singling out one relevant condition of what happened from the others. In the cases we have examined, at least, the historian's reason appears to derive from moral considerations.

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It is doubtful that such conclusions would prove welcome to most historians. It is not, perhaps, what they had in mind in urging that theorizing about history take care to concern itself with actual historical practice; and they may hope and expect that further analysis would bring to light nonmoral principles of selection which would have at least an equal claim to explicate the existing causal concept. I cannot in the remainder of this paper take note of all the possibilities which have been suggested in this connection. I should like, however, to comment briefly on what may appear to be one attractive alternative to the present moralistic account. I refer to the account of causal selection given by H. L. A. Hart and A. M. Honoré in their recent and impressive book, *Causation in the Law*.[28]

According to Hart and Honoré, the criteria for selecting causal conditions, in everyday life and history as well as in the law, can be reduced to two. The first is that causes are abnormalities, although the concept of the "normal" varies subtly from context to context. The second is that voluntary human actions, being *ex hypothesi* themselves uncaused, have a special claim to causal status. Both these notions have an obvious connection with what might be thought of as the primitive experience which gives the concept of causation a meaning for us: the experience of interrupting the course of nature, and thus, to an extent, imposing our wills upon it. Looked at from two different sides, our own causal activity is both an intervention and an abnormality—something we deliberately *do,* and hence something not otherwise to have been expected.

In explaining the way the concept of "abnormality" guides causal selection, Hart and Honoré point out that, in the investigation of human affairs, what we usually want to explain is itself some deviation from the ordinary or expected course of events. And it is entirely natural that we should try to explain an abnormality by an abnormality. In human contexts, however, what counts as "the ordinary course of events" may at the same time be something highly contrived. It will often obtain because of certain procedures, long since become customary, which have altered an original course of nature to serve human purposes. When such a customary norm breaks down, a relevant antecedent abnormality is often some deviation from the protective customary procedures, which is then regarded as the cause of the breakdown. Thus what is selected as cause will often be an omission which *coincides* with what is reprehensible by established standards of conduct. But this, the authors contend, "does not justify the conclusion which some have drawn

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that it is so selected merely *because* it is reprehensible."[29] If the flowers in my garden wither, I may select the gardener's failure to water them as cause. But I can do this, it seems, only because it is customary (i.e., normal) for gardeners to water flowers, and the failure is thus a relevant abnormality.

Now, although I have the profoundest admiration for most of what Hart and Honoré have to say about causation, it does seem to me that on the present point we are in danger of being misled. Is it really because we expected the gardener to perform his duties, simply in the predictive sense of "expect," that we regard his failure as the cause? If expectation comes into it, is it not in the prescriptive sense? We cite the omission as cause because flower-watering was to be expected of a gardener; it is what he ought to have done. In a similar way, the revisionist historian, Avery Craven, supports his causal conclusion with the judgment that it is the statesman's business to seek compromise. One might surely doubt, too, that the Northern conspiracy theorist's causal conclusion implies his belief that the institution of slavery was abnormal in the sense of being not customary. Is it not, rather, that he regards it as abnormal in a value-charged sense? It is true that historians themselves sometimes make use of the concept of "abnormality" in a way which might be thought to vindicate the contention of Hart and Honoré. Thus Stampp writes, " 'revisionist' historians apparently believe that pre-Civil War political leaders were unusually incompetent, that their acts and decisions were grotesque and abnormal. Their exaggeration of sectional differences, their invention of allegedly fictitious issues (such as slavery expansion) created a crisis that was highly artificial and eventually precipitated a 'needless' war."[30] But as the coupling with "grotesque" and "incompetent" suggests, it is not at all clear that the term "abnormal" is used here in a purely descriptive sense. This is even clearer in Randall's own revisionist use of it. "Omit the element of abnormality, of *bogus* leadership or *inordinate* ambition for conquest," he says, "and diagnosis fails."[31]

The second principle of selection proposed by Hart and Honoré may appear to be more acceptable. The notion of voluntary action as cause well accords with both our ordinary notion of a cause as "active," and our tendency to regard causes as "interventions."[32] Clearly, if I hand over my purse at gunpoint, it is to the actions of the gunman that we look for the cause of my loss, not the reluctant response of myself. The principle that, of a number of relevant human actions, the most voluntary one is to be selected as the

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cause may also appear to throw considerable light on some of the historical judgments we have already examined. Certainly, it seems to be the view of Northern and Southern historians holding the conspiracy theory that the actions of the extremists on each side were causes, while the responses of the men of their own section were not, because the latter were "forced" by the former, and in that respect were not fully voluntary. In each case, the noncausal responses are represented as responses to threats. As Jefferson Davis contends: "When Lincoln's intention to reinforce the Fort became known, no alternative remained for the Confederates but to capture the fort."[33] The principle might also be brought to bear on what is claimed by conflict theorists, for in this case, it might be claimed, the reason why the actions of neither North nor South are causes is because in neither case were they voluntary. Given the situation they were faced with, *neither* side was "free" to solve the problem without war. "The unhappy fact," writes Schlesinger, "is that man occasionally works himself into a log-jam; and that the log-jam must be burst by violence."[34]

For present purposes, there is only one thing which needs to be pointed out to anyone accepting this analysis, and that is that the concept of a voluntary action, as Hart and Honoré (I think correctly) employ it, is itself a quasi-moral concept. As they put it, it is the concept of an action which is not "defective" in any of a miscellaneous number of ways.[35] And to determine whether or not it is so, it is necessary to decide whether the agent faced such problems as that of self-preservation (which raises the question of the reasonableness of regarding something as a threat to a vital interest), or safeguarding the rights of oneself or others (which requires the use of moral criteria outside narrowly legal contexts), or of honoring pressing obligations (which might, once again, be moral as well as legal). Hart seems to admit that at the point where we must decide whether what was done was a reasonable step to have taken in the circumstances—for example, whether it was the "lesser of two evils"—the concept of a fully voluntary action "incorporates" (although indirectly) judgments of value. It would surely follow that causal judgments using this criterion of selection would likewise incorporate judgments of value.[36] And in saying that they incorporate them, one is not just saying that the two judgments happen to coincide.

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1. Besides the opinions noted in the text, see that of T. J. Pressly in *Americans Interpret Their Civil War* (Princeton: Princeton University Press, 1954), p. viii.
2. See Cushing Strout, *The Pragmatic Revolt in American History: Carl Becker and Charles Beard.* New Haven: Yale University Press, 1958.
3. Lee Benson and Cushing Strout, "Causation and the American Civil War," *History and Theory,* 1961, *1:* 175.
4. Kenneth M. Stampp, *The Causes of the Civil War* (Englewood Cliffs, N. J.: Prentice-Hall, 1959), p. vi.
5. This claim was also advanced, but insufficiently supported, in my *Laws and Explanation in History* (New York-London: Oxford University Press, 1957), pp. 99-100.
6. For more detailed surveys (to which this paper is indebted), see the works by Pressly, Strout, and Stampp already noted; and also H. K. Beale, "What Historians Have Said about the Causes of the Civil War," in *Theory and Practice in Historical Study* (Social Sciences Research Council, Bulletin No. 46, 1946), pp. 53-102; Lee Benson and T. J. Pressly, "Can Differences in Interpretations of the American Civil War Be Resolved Objectively?", a paper discussed by the American Historical Association, 29 December 1956; and Charles W. Ramsdell, "The Changing Interpretations of the Civil War," *Journal of Southern History,* 1937, *3:* 3-27.
7. Thus Alan Nevins at the end of volume 2 of his *Emergence of Lincoln* (New York: Scribner, 1960) undertakes to single out the "main root of the conflict," which he finds to be "the problem of slavery with its complementary problem of race-adjustment." The "main source of the tragedy," he adds, was the "refusal of either section to face these conjoined problems squarely and pay the heavy cost of a peaceful settlement" (p. 468).
8. Pressly, *op. cit.,* p. 8.
9. Kenneth M. Stampp, *And the War Came* (Baton Rouge: Louisiana State University Press, 1950), pp. 285-286.
10. Beale, *op. cit.,* p. 61.
11. Stampp, *Causes,* pp. 107-108.
12. Pressly, *op. cit.,* p. 143.
13. *Ibid.,* p. 64.
14. *Ibid.,* p. 152.
15. *Ibid.,* p. 171.
16. *Ibid.,* pp. 177, 180.

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17. Charles A. and Mary Beard, *The Rise of American Civilization* (New York: Macmillan, 1927), vol. 2, pp. 10, 54.
18. A. C. Cole, *Irrepressible Conflict, 1850-1865* (New York: Macmillan, 1934), p. xiii.
19. Stampp, *Causes,* p. 122.
20. *Ibid.,* pp. 85-86.
21. T. N. Bonner, "Civil War Historians and the 'Needless War' Doctrine," *Journal of the History of Ideas,* 1956, *17*: 193.
22. *Ibid.,* p. 216.
23. Pressly, *op. cit.,* p. 274.
24. Bonner, *op. cit.,* p. 209 (my italics).
25. Stampp, *Causes,* p. 121.
26. *Ibid.,* pp. 116-117.
27. *Ibid.,* p. 116.
28. H. L. A. Hart and A. M. Honoré, *Causation in the Law.* Oxford: Clarendon Press, 1959.
29. *Ibid.,* p. 35.
30. Stampp, *Causes,* p. 82.
31. *Ibid.,* p. 84 (my italics).
32. Hart and Honoré, *op. cit.,* pp. 38 ff.
33. Pressly, *op. cit.,* p. 63.
34. Stampp, *Causes,* p. 117.
35. Hart and Honoré, *op. cit.,* pp. 38-39.
36. *Ibid.,* p. 147.

Comments by Newton Garver

MR. DRAY NOTES THAT historians are often unable to agree about the cause of important happenings, and he asks himself why this should be so. His answer is that the concepts of value and of causation as the historians understand it "are not logically separable. And, of course, historians can be depended on to disagree about values" (page 579); or, as he puts it later on (page 587), that causal judgments in history are "logically dependent" on judgments of value.

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I propose to discuss this thesis first by pointing out certain limitations on it, some of which Mr. Dray recognizes, and all of which I expect him to acknowledge, and then by trying to specify the sense of "logically dependent" and "judgment of value" in which his thesis can be regarded as true; and finally, by commenting briefly on the importance of this thesis.

The requirements of scholarship restrict the extent to which a historian's moral outlook can influence his conclusions about the causes of historical events: he must choose the cause from among the facts acknowledged to be relevant, and his account must take into consideration all the principal facts acknowledged to be relevant.* Mr. Dray takes note of this restriction when he points out (page 580) that there is substantial agreement among historians as to what facts are relevant to an understanding of the Civil War. Scholarship also imposes a burden of consistency, a subtle and important matter which it would be difficult to expound accurately, but which must be kept in mind as limiting the application of Mr. Dray's general thesis.

If facts and scholarship as well as values enter into controversies about the causes of historical events, we may ask whether the logical order of precedence among these factors constitutes another restriction on the dependence of causal judgments on value judgments. I think that it does. Mr. Dray shows that the judgment that the cause of the Civil War was Lincoln's conspiring to bring it about (which judgment may be presumed to depend on a prior judgment that Lincoln was reprehensible) can be defeated by calling attention to facts about Lincoln's intentions; and we may agree that in general causal judgments that stem from evaluations of this or that person may be defeated by factual considerations. But moral evaluations of a person's character or actions (that is, the third sort distinguished below) cannot *in general* defeat a causal judgment, and I should think that by themselves they could never do so: one cannot refute the theory that it was the actions of Southern politicians that caused the war *simply* by maintaining that the Southern politicians were admirable men and Lincoln a blackguard. Facts, therefore, have a logical precedence over evaluation

* It would be interesting but out of place to inquire on what principles a historian decides which facts are relevant. Mr. Dray assumes throughout that it has been antecedently determined which facts are relevant, and I shall follow him in making this admittedly large assumption.

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judgments; and the recognition of this precedence further qualifies the general thesis.

Finally, it must be noted that Mr. Dray is speaking about only a part of the historical enterprise. A historian may presumably assemble material from the Public Records Office, or discuss the relevance of this or that fact, without coming to any causal conclusion. If I understand him correctly, Mr. Dray has nothing whatever to say in his paper, even by implication, about these other aspects of a historian's business.

Let us now consider in what sense causal judgments in history may be said to be "logically dependent on" or "not logically separable from" value judgments, and examine the various possible senses, from strong to weak, until we find a sense that suits the thesis in hand.

The conclusion of a fully explicit valid argument depends logically on a certain premise if and only if the argument would be invalid if that premise were suppressed. This, I believe, is the clearest and strongest sort of logical dependence; but it cannot be in this sense that causal judgments in history depend logically on value judgments. Historians do not generally state the value judgments involved as premises in what purports to be a deductive argument, and they may not explicitly state their values at all. Neither of these omissions, however, necessarily prevents them from presenting a perfectly adequate causal account of the historical situation. I take it that Mr. Dray would not wish to maintain that the argument supporting the conflict theory is deficient because it does not contain the premise that the alleged conspirators are to be exonerated from blame for causing the Civil War.

A closely related sense of "logical dependence" is the sense in which the conclusion of an enthymeme may be said to depend logically on its suppressed premise. For reasons similar to those in the preceding paragraph, this cannot be the intended sense of the suppression. Historical arguments leading to causal conclusions are not enthymematic if the values of the historian are not laid out on the table: to say what the values of the historian are may help in some way to understand his argument, but it does not fill in a gap in the argument.

A third sense in which something may be said to depend logically on something else is the sense in which Aristotelian inferences depend on the nonemptiness of the classes involved, and the

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closely related sense in which, according to Wittgenstein's argument, understanding sensation statements depends logically on understanding behavior statements. In both these cases we may say that something is presupposed: in Aristotelian logic it is the existence of certain sorts of things which is presupposed, and according to Wittgenstein's argument it is what he would call participation in a language game or a way of life. The two characteristic features of this sort of logical dependence are (1) that, given whatever is logically dependent, one can infer on logical (though not formal) grounds alone that the presupposition must obtain, and (2) that one can verify independently that the presupposition obtains. On both these counts the dependence of causal judgments in history on value judgments fails to qualify. One can no doubt usually infer at least something about a historian's values and moral judgments from his historical conclusions, but the basis for such inferences lies in exegesis and interpretation rather than in principles of logic. And it may be the case—I should think it often is—that one cannot assess the value judgments on which a historical account "logically depends" without *pari passu* assessing the dependent causal judgments in that account. We seem here much closer to what Mr. Dray has in mind, but I conclude that it cannot be in quite this third sense that causal judgments in history depend on value judgments.

A fourth and weaker sense in which one thing might be said to be "logically dependent" on another is the sense in which it might be said that a man's being guilty of murder is "logically dependent" on his having acted unjustifiably. If one man has killed another and has not acted unjustifiably, he is not guilty of murder but of manslaughter or some other sort of justifiable homicide. Here it is of doubtful accuracy to speak of the "dependence" of the one thing on the other: in judging that a man is guilty of murder, one necessarily judges that he acted unjustifiably, but the latter need not be in any way a prior or independent judgment. It would be more felicitous in this case to use Mr. Dray's alternative locution and to say that a man's being guilty of murder is "not logically separable" from his having acted unjustifiably. It is in this sense that there can truly be a logical relation between certain moral or quasi-moral judgments and causal judgments in history; the two are not logically separable: whenever a historian makes a judgment about the cause of a historical event, then he must pari passu make a judgment that certain individuals either are or are not responsible for it.

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In stating his thesis Mr. Dray has spoken of the values or the value judgments of the historian. I must say straight off that I believe that this is a loose and inaccurate way of speaking: it is not the values or the value judgments of a historian which are logically inseparable from his causal judgments, but another related sort of judgment. That this is so can be seen by imagining that Bernhardi or some other person who puts a high value on war were writing about the Civil War—for Mr. Dray's evidence is biased in that all his historians appear to take a dim view of war, regarding it perhaps as a necessary evil, but as an evil nonetheless. Bernhardi might agree with a Southern conspiracy theorist that it was certain of Lincoln's considered actions which caused the Civil War, and then *praise* Lincoln rather than *blame* him for these actions. That such a divergence among historians can occur shows decisively that neither their estimates of the value of the war nor their moral judgments about Lincoln are logically inseparable from their causal judgments.

In this example, it is useful to distinguish three sorts of judgment on the moral side of the equation: (1) value judgments, as that war is a good or a bad thing; (2) ascription to the agent (Lincoln) of responsibility for the event in question; and (3) moral judgments as to the agent's moral worth or merit in respect of a certain action. Furthermore, the moral judgment about Lincoln's merit or worth can be seen to be a direct function of the other two judgments. The one judgment about which our two fictional historians agree is that responsibility for the Civil War is to be ascribed to Lincoln. In general, it is this sort of judgment—ascriptions or denials of responsibility—which can truly be said to be not logically separable from causal judgments. A historian need neither decide about the desirability of an event nor pronounce judgment upon the putative agent, but in explaining an historical event he necessarily ascribes or denies responsibility to the agents involved. I take this to be the true thesis which Mr. Dray has presented and in support of which he has adduced evidence.

I regard judgments that so-and-so is responsible for something as highly problematic. They should perhaps be regarded as preliminary to moral judgments, rather than as being proper moral judgments in themselves, since they are compatible with both praise and condemnation. Yet, although ascriptions of responsibility may be said to be morally neutral in this sense, they are not morally aseptic. Mr. Dray has argued effectively in the last part of his paper that

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such judgments are logically dependent on certain value judgments, namely, judgments as to what sort of behavior is normal or reasonable. From this it does not follow that ascriptions of responsibility are themselves value judgments—I should think they are not—but it does follow that they cannot be purely empirical or purely scientific. Without pursuing the status of these judgments any further, however, we may agree that it is ascriptions of responsibility which are not logically separable from causal judgments in history.

The true thesis which I take to be presented in Mr. Dray's paper is, then, that ascriptions (or denials) of responsibility are not logically separable from causal judgments in history. It must be admitted that Mr. Dray also appears to be advancing another thesis, which I take to be stronger, more startling, and false, namely, that causal judgments in history are logically dependent (in one of the stronger senses) on proper moral judgments. He explicitly states this further thesis at the beginning of the last section of his paper (page 587), and he implies it at other places, for instance, when he says: "That the actions of either the Black Republicans or the slaveholders and their allies were the causes of the war is a judgment which requires the prior judgment that the same actions were reprehensible" (page 581). This other thesis is stronger because an ascription of responsibility is a necessary preliminary to any proper moral judgment, and thus, if this thesis were true, the one which I accept would have to be true as well. It is the more startling because it entails that historians cannot agree about the causes of events unless they agree about what things are good and what things bad, and about which persons are admirable and which reprehensible—which suggests the absurd proposal that moral indoctrination ought to have a prominent place in the training of historians; and it is false because what it entails is false: historians *can* make causal judgments without moralizing.

It might be suspected that, since I reject Mr. Dray's stronger thesis and accept only his more modest one, my divergence from him is more substantial than my agreement. I do not believe that this is so, for the modest thesis is not only true but also important: it clearly identifies the matter of explaining historical events as a humanistic enterprise. To select what would ordinarily be called "the cause" from a set of factors whose relevance is acknowledged or scientifically determined—this makes sense, in history as well as in engineering, only if there is some practical concern which serves

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to put the relevant factors into this further focus. It is perhaps misleading that Mr. Dray makes historians seem too uniformly moralistic, for they may make causal judgments in connection with social engineering—that is, to suggest a policy in some analogous situation—as well as in connection with moralizing. But in either case responsibility must be ascribed, and the enterprise has an irreducible humanistic element. Thus our agreement upon the more modest thesis would place Mr. Dray and myself on the same side in the current philosophical controversy over the nature of historical explanation, as opposed to those who maintain that causal explanations in history are a matter of pure cold science.

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EDWARD GRANT

Hypotheses in Late Medieval and Early Modern Science

IT WAS NOT long ago that the expression "medieval science" signified for most educated people a contradiction in terms. Not until the first two decades of this century, when Pierre Duhem published his magnificent series of volumes on medieval scientific thought, was this idea dispelled. Duhem, after an intensive examination of the manuscript sources, showed that in the course of the middle ages significant scientific concepts were formulated which contributed substantially to the Scientific Revolution in the seventeenth century. He not only awakened interest in actual scientific achievements but also focused attention on methodological concepts—especially those dealing with the truth or falsity of fundamental scientific principles or hypotheses.

The researches initiated by Duhem have been extended by a number of eminent scholars concentrating on the substantial content of medieval science. In recent years, however, as concern with methodological problems in modern science has intensified, there has been a concomitant increase in research devoted to methodological procedures in medieval science. Studies by John Herman Randall, Jr., A. C. Crombie, William A. Wallace, O. P., and others have revealed something of the medieval understanding of scientific method from the thirteenth to the sixteenth centuries. Each of the scholars named above has stressed the similarity in methodology between medieval and seventeenth-century science.

Crombie, whose views are widely known, insists that under Platonic influences some medieval thinkers treated the forms of things mathematically rather than in the qualitative, definitional manner characteristic of Aristotle. They applied mathematics to nature and sought to formulate natural laws mathematically. They utilized and developed the essentially Aristotelian method of reso-

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lution and composition in which a complex phenomenon was first analyzed and resolved into its component elements, after which a causal explanation was sought. Since a number of causes were possible, it was found useful to elicit testable consequences from each of them in turn, thus eliminating those incompatible with experience and observation. This latter procedure, known as "verification and falsification," served to strike out obviously false causes, but was of little value in deciding between those explanations which survived this initial pruning process. At this juncture the ancient "principle of economy" was frequently invoked and enabled the less simple causal accounts to be ruled out. It was recognized that a cause arrived at by such a procedure was of a probable or hypothetical character, since it could not be affirmed beyond doubt.

The claim for the importance of medieval scientific methodology in the history of science is thus made to depend, in the first instance, on its anticipation of seventeenth-century methodology. Its significance would be even more profound if it could be shown that some sort of reasonably well-defined methodology was instrumental in producing the Scientific Revolution. Discussion of this latter aspect, however, is far beyond the scope of this paper. But the first claim *is* relevant here, and it will be seen that, although certain similarities may be discerned between the methodologies, they were yet separated by a fundamental difference which had significant consequences on the scientific outlook of the two periods. In medieval methodology phenomena could be explained by principles, assumptions, or hypotheses which need not be true, since their sole function was to account for, or "save," the phenomena. The truth or falsity of such hypotheses was indeterminable. This attitude was emphatically rejected by many of the greatest figures responsible for the Scientific Revolution, and thus the two methodologies parted ways.

Any consideration of the function of hypotheses in the science and thought of the Middle Ages must be at least two-fold. One line of investigation is connected directly with passages in Aristotle's *Posterior Analytics* concerning the meaning and use of the term *hypothesis,* along with the related term *postulate.** Aristotle defines these terms as relatives to a learner when he says, "Anything that

* Tracing the vicissitudes of the term *hypothesis,* or *suppositio* as it was usually called in the Middle Ages in the sense just outlined, would require a careful examination of commentaries on the *Posterior Analytics* and quite possibly commentaries on Euclid's *Elements,* in which discussions on the foundational principles of the *Elements* were influenced by Aristotelian concepts.

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the teacher assumes, though it is a matter of proof, without proving it himself, is a hypothesis if the thing assumed is believed by the learner, and it is moreover a hypothesis, not absolutely, but relatively to the particular pupil; but, if the same thing is assumed when the learner either has no opinion on the subject or is of a contrary opinion, it is a postulate" (I, 10, 76b 27-34).[1] Earlier in the same treatise, Aristotle characterizes a hypothesis as asserting the existence or nonexistence of a subject (I, 2, 72a 19-21).[2]

The second aspect of hypothesis is associated with the ancient Greek concept of "saving the phenomena" in astronomy. Pierre Duhem in *Le Système du Monde* traced the development of this concept in Greek scientific thought and showed how, along with Ptolemaic astronomy, it gained almost complete acceptance in the fourteenth century. But the medieval understanding of "saving the phenomena" as it related specifically to hypotheses concerning the rotation of the earth on its axis, was to undergo a striking transformation in the revolutionary astronomical pronouncements by Copernicus in the sixteenth century. This transformation, involving a shift from an attitude of indifference regarding the truth or falsity of an astronomical hypothesis to one of insistence upon truth, was an integral part of the initial phase of the scientific revolution. For this reason, if for no other, Copernicus deserves to rank as the first great figure of that momentous revolution.

To understand the significance of his achievement, let us review the ancient and medieval doctrine of "saving the phenomena," as well as the major intellectual currents which tended to induce and perpetuate a state of mind highly favorable to this concept. Among the Greeks, Plato appears to have been the first to propose that the fundamental objective in astronomy is to "save the phenomena" or "appearances." This objective remained throughout the history of Greek astronomy and in the sixth century A.D. was admirably summarized by Simplicius. In his commentary on the *Physics* of Aristotle,[3] Simplicius contrasts the fundamental activities of physicists and astronomers, remarking,

> The things . . . of which alone astronomy claims to give an account it is able to establish by means of arithmetic and geometry [and at times an astronomer] invents by way of hypothesis, and states certain expedients by the assumption of which the phenomena will be saved. For example, why do the sun, the moon, and the planets appear to move irregularly? We may answer that, if we assume that their orbits are eccentric circles or that the stars describe an epicycle, their apparent irregularity will be saved.

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Finally, in the same passage, Simplicius says that the astronomer "introduces hypotheses under which some bodies remain fixed, while others move, and then considers to which hypotheses the phenomena actually observed in the heaven will correspond."

These passages were probably unknown in the Middle Ages, since apart from fragments Simplicius' commentary on the *Physics* seems to have remained untranslated. His commentary on Aristotle's *De caelo*, however, was translated into Latin in 1271, and there we find a reference to "saving the phenomena," when Simplicius, referring to Plato and the Pythagoreans, says that "perhaps they did as the astronomers, some of whom admit certain hypotheses and others other hypotheses without categorically affirming that these different mechanisms actually exist in the heavens."[4]

In general, we see that a successful astronomical hypothesis need only account for the motions of the celestial bodies. Its truth or falsity is not at issue. This attitude was adopted in the Middle Ages by most scholastic philosophers and theologians who concerned themselves with astronomy or physics. For example, St. Thomas Aquinas, in his commentary on the same *De caelo*, says of astronomical hypotheses, "It is not proper to say that these hypotheses are true, since the appearances of the stars might be saved in some other way as yet unknown to men." Nevertheless, a few disturbed voices were raised in the thirteenth century. Robert Grosseteste was puzzled that the mathematical devices of Ptolemaic astronomy could "save the phenomena" and yet violate Aristotelian physical principles at a number of points.[5] Bernard of Verdun went further and insisted that if Ptolemaic astronomy did indeed "save the phenomena," its basic hypotheses had to be true. False hypotheses could not save the appearances. Armed with this conviction, Bernard attempted to devise a cosmology with physical eccentrics and epicycles. His naive faith, as we shall see, is closely akin to that of Copernicus, but whereas Bernard in defense of Ptolemy left the dust of history undisturbed, Copernicus was to set it whirling into the cosmos, to settle again only after the completion of the scientific revolution in the seventeenth century. The insistence on reasoning from physically true principles, as advocated by Bernard of Verdun, gained little support in the fourteenth century, because it ran counter to powerful intellectual currents of the late thirteenth century which indirectly supported the doctrine of "saving the phenomena." We must now summarize these.

Following the translation and dissemination of the Aristotelian

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philosophical and scientific corpus in the thirteenth century, a strongly Aristotelian bias permeated the faculties of the arts in the universities of Paris and Oxford. Controversy was not slow in developing. Many members of these faculties defended deterministic arguments limiting God's power over his own universe: God would not and indeed could not violate the principles and laws governing the physical universe.

Theologians and ecclesiastical authorities feared the consequences of philosophical doctrines that placed God in bondage to physical laws and principles of His own creation. Their reaction was embodied in the dramatic condemnations of 1270 and 1277 embracing 13 and 219 condemned propositions, respectively. Many propositions thought to have been demonstrated metaphysically were henceforth by ecclesiastical decree altered in status from "certain" to "possible." Conversely, propositions previously shown on metaphysical grounds to have been untenable were now expected to receive a proper hearing, no matter how absurd they may have seemed to contemporary philosophers. An air of uncertainty replaced the self-confidence in metaphysical and philosophical demonstration which had prevailed in the thirteenth century before 1270.

If the demise of metaphysics began because of ecclesiastical decrees, it received another blow in the fourteenth century when William Ockham used philosophical argument further to weaken and restrict the scope of metaphysics. Traditional metaphysical arguments concerning God's unicity, existence, and other "necessary" attributes fell victim to Ockham's nominalism. A number of Ockham's basic positions resulted in delimiting the scope of man's certain knowledge. Cosmic verities were beyond man's capacities, since in a contingent world God's absolute power could work in ways unfathomable by the human intellect. Certainty became a mundane affair, inasmuch as the knowledge attainable by man was derived only from experience, by what Ockham called "intuitive cognition." The immediate apprehension of a particular thing leads one to say that it exists. No demonstration is needed to underwrite the certainty of such direct experiences. But to make necessary inferences from such directly apprehended particulars to underlying essences, realities, principles, or causes was ruled out as logically untenable, although presumably one might "save the phenomena" in physical problems by hypothetical explanations. Indeed, as Duhem has noted, Ockham was aware that different hypotheses might equally well save a given phenomenon.[6]

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Ockham's radical empiricism erected a "barrier between practical experience and super-sensory knowledge; it meant the dismissal of metaphysics, concepts of value, and above all, theology, as beyond the ken of reason: to discuss them was not to discuss facts but to speculate upon possibilities; since they were not subject to verification they could not be regarded as certain."[7] Furthermore, God's *potentia absoluta* unleashed a theological scepticism which "allowed speculation and uncertainty to reign where knowledge and proof were lacking."[8] Thus God's absolute power, as asserted by the ecclesiastical authorities in the condemnations of the thirteenth century, was vindicated by Ockham and the nominalist movement in the fourteenth century. Many were to go beyond Ockham. God's power and the probable character of knowledge are emphasized by John of Mirecourt, who said "I call probable anything which is neither known nor believed from the Catholic faith, nor determined by the church, nor stated by such a one whose statement none ought to deny or to assert its opposite. Probable is commonly accustomed to be so described."[9] And Pierre Ceffons could say that "nothing prevents some false propositions from being more probable than some true ones."[10] Emphasis was laid on probability, uncertainty, and the paradoxical.

If, however, one result of the condemnations was the demise of metaphysics, accompanied by a swing to empiricism, another result in Duhem's opinion was nothing less than the beginnings of modern science. Duhem singled out the following two condemned propositions as heralds of modern science: "God could not make several worlds" and "God could not move the heavens with rectilinear motion because a vacuum would remain." Both these propositions were in accord with Aristotelian cosmology and physics, but their condemnation meant that arguments acknowledging God's power to create a plurality of worlds or to move this world in a straight line regardless of any remaining void were perfectly respectable. According to Duhem, science and scientific imagination were liberated from a blind adherence to Aristotelian principles and arguments. All were encouraged to challenge Aristotelian concepts. A spirit of free inquiry was born, resulting ultimately in the creative scientific achievements of the fourteenth century, which in turn were instrumental in producing the seventeenth-century scientific revolution.

There is little doubt that fourteenth-century scientific literature reveals an abundant display of scientific imagination, as evidenced by the frequent occurrence of the phrase *secundum imaginationem*

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—especially in treatises written by nominalists. Significantly, however, these imaginative scientific proposals were formulated for the most part without regard for application to the physical world. The mind was free to create—subject only to the demands of logical consistency. Boldness in scientific speculation was counterbalanced by a noticeable restraint in claiming physical truth for these speculations. The truth or falsity of assumptions or hypotheses was not at issue.

An explanation of this striking attitude is not far to seek. The condemnations of 1277 and the nominalism which they spawned as philosophical justification were sufficient restraints on unqualified claims to have laid bare the true "book of nature." Jean Buridan, one of the most influential of nominalist physicists, reveals the potency of both these currents. In a discussion of Aristotelian rules of motion, Buridan holds that constant forces are required, but he remarks that uniform forces and motions have not been detected in nature. "And from these things it seems to me it must be inferred that these rules are rarely, or never, found to produce their effect. Nonetheless, these rules are conditional and true, for if the conditions stated in the rules were observed, everything would occur just as the rules assert. For this reason it ought not to be said that the rules are useless and fictitious because, although these conditions are not fulfilled by natural powers, it is nevertheless possible, in an absolute sense, for them to be fulfilled by the divine power."[11] Thus for Buridan the rules are logically consistent and would produce the proper effects *if only* the conditions were realized in nature. It is a purely hypothetical discussion. He is quick to note that in any event God could fulfill the required conditions, and the rules would then obtain.

In another passage, Buridan shows how gingerly questions with theological implications had to be treated. In applying his famous impetus theory to celestial bodies, Buridan conjectures that God may have impressed impetus into each celestial body. "And these impetuses which He impressed in the celestial bodies were not decreased nor corrupted afterwards, because there was no inclination of the celestial bodies for other movements. Nor was there resistance which would be corruptive or repressive of that impetus. But this I do not say assertively, but [rather tentatively] so that I might seek from the theological masters what they might teach me in these matters as to how these things take place."[12]

The liberation of scientific imagination which for Duhem fore-

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shadowed the advent of modern science was in my opinion derived from at least two significant sources. It was a convenient outlet for frustrated philosopher-scientists who, fully cognizant of the omnipresent condemnations, wished to avoid entanglement in theological controversy, and it was the logical outcome of an adherence to a nominalism which, on logical grounds, withheld its philosophical imprimatur from the quest for underlying physical truths and realities. It thus encouraged exercises in scientific imagination by which one might seek to save the phenomena or simply conjure up hypothetical physical problems. If the first of our reasons impressed upon the philosophers or masters of arts that, in contrast with revealed truth, natural "truths" could be at best only probable, with other alternatives always possible (at least for the divine power), the theologians, in sharp contrast, found that the condemnations encouraged their predilection to dwell on the limitations and paradoxical character of human knowledge and to formulate refutations of those who sought some semblance of physical truth in a world of flux and appearance. It is from this standpoint that I should like to consider the attitudes of Jean Buridan, the philosopher and master of arts, and Nicole Oresme, the theologian, toward the question of the earth's daily rotation on its axis, and to contrast their attitudes with that of Copernicus and some of his most illustrious successors.

Buridan insisted[13] that one could save the *astronomical* appearances by assuming the earth to be stationary with the heavens rotating, or the heavens at rest and the earth in diurnal rotation. He says that astronomers "posit a method by which appearances are saved, whether or not it is so in actuality. Appearances can be saved in either way; hence they posit the method which is more pleasing to them." Appealing to experience, he believed the earth was at rest, for if the earth rotated, we should expect an arrow shot vertically into the air to fall somewhat behind, since its impetus or momentum would enable it to resist the push of the air as the latter, accompanying the rotating earth, swept past the arrow. Failing to observe such an effect, Buridan concluded that the earth must be at rest. This appeal to an experientially verifiable consequence was the strongest argument that a nominalist like Buridan could muster.

Nicole Oresme also rejected the motion of the earth,[14] but his rejection was not founded on scientific argument, since contrary to Buridan he shows that neither reason nor experience can decide the issue. Although accepting most of Buridan's arguments, Oresme

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repudiates the crucial "arrow experience" by noting, among other counter-arguments, that "if a person were on a ship moving toward the east very swiftly without his being aware of the movement, and he drew his hand downward, describing a straight line against the mast of the ship, it would seem to him that his hand moved with a rectilinear movement only. According to this opinion [of the diurnal rotation of the earth], it seems to us in the same way that the arrow descends or ascends in a straight line." After supplying further arguments, Oresme insists that "one could not by any experience whatever demonstrate that the heavens and not the earth are moved with diurnal movement." Yet Oresme believed that the earth is stationary, since arguments in favor of its rotation "are persuasions which do not make the conclusions evident. But having considered everything which has been said, one could by this believe that the earth and not the heavens is so moved, and there is no evidence to the contrary. Nevertheless this seems *prima facie* as much, or more, against natural reason as are all or several articles of our faith. Thus what I have said by way of diversion in this manner can be valuable to refute and check those who would impugn our faith by argument."

Thus a straightforward scientific question culminates for Oresme in a sharp theological point. If reason and experience are incapable of demonstrating a question in science, how utterly inadequate they must be in demonstrating questions of faith. It is not even possible to determine which of two alternative hypotheses is physically true. Opting for a motionless earth was for Oresme a matter of "natural reason," not demonstration or argument.

The difference in attitude between Buridan and Oresme represents a two-fold reaction to the Condemnations of 1277 by philosophers or masters of arts on the one hand, and theologians on the other. Buridan recognized that one could not choose between the rival hypotheses on astronomical grounds, and he appealed to experience. But recourse to experience was not conclusively demonstrative, as Buridan well knew, for which reason, no doubt, he characterized his "arrow experience" as merely "more demonstrative" than any other argument. The condemnations compelled a recognition of alternative possibilities, even though one may have been convinced of their absurdity or impossibility: for was it not true that what was naturally impossible was supernaturally possible in virtue of God's absolute power? The dilemma which faced medieval natural philosophers has been admirably depicted by Alexandre Koyré in a discussion of the specific proposition concerning God's

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power to create a plurality of worlds. Scholastics, Koyré remarks, were constrained "to study the conditions of possibility of the universes which God could have created had he wished to do so, but which he did not create because he did not wish to do so."[15] Scientific imagination was therefore not merely stimulated, as Duhem would have it, but overstimulated, to the extent that revolutionary ideas or concepts enunciated in such an intellectual environment would have been mere alternative possibilities which might at best be "more demonstrative" or more probable than others.

For theologians like Oresme, however, the condemnations underscore the inability of reason and experience to determine theological or physical truths. As Ockham and the theologians had confounded the philosophers with philosophical argument, Oresme delights in using scientific arguments to negate the efforts of the philosopher-scientists. The question of the diurnal rotation of the earth is only one of a number of problems in which Oresme argues to a stalemate.

The intellectual currents which dominated the universities of Oxford and Paris in the fourteenth century flowed to the universities of Eastern Europe in the late fourteenth and fifteenth centuries. The manuscript treatises extant at the University of Cracow suggest that significant fourteenth-century scientific questions were discussed and debated. Pehaps Copernicus as a student at Cracow heard and utilized some of the arguments on the possibility of the earth's motion. Indeed, his defense of the earth's rotation incorporates significant points developed in fourteenth-century discussions of the same problem. Whatever the debt to his medieval predecessors and contemporaries, there is little doubt that Copernicus marks a momentous break with the dominant nominalistic outlook in late medieval science. This break is embodied in Copernicus' insistence that we can attain to fundamental truths about the physical universe only by reasoning from hypotheses or assumptions which are indubitably true. The diurnal and annual motions of the earth were for him true physical hypotheses.

In the preface to his immortal *De revolutionibus,* Copernicus observes that since others had been allowed to "assume certain circles in order to explain the motions of the stars, I believed it would readily be permitted me to try whether, on the assumption of some motion of the earth, better explanations of the revolutions of the heavenly spheres might not be found."[16] However, when he became convinced that not only did the "phenomena necessarily follow therefrom, but the order and magnitude of the stars and all

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their orbs and the heaven itself are so connected that in no part can anything be transposed without confusion to the rest and to the whole universe,"[17] he did not suppose that his initial assumption was only a convenient conjecture or probable hypothesis. On the contrary, the simpler universal order resulting from an initial assumption of the earth's motion moved him to proclaim boldly that he was not "ashamed to maintain that all that is beneath the moon, with the centre of the earth, describe among the planets a great orbit round the sun which is the centre of the world; and what appears to be a motion of the sun is in truth a motion of the earth."[18]

More explicitly, in criticizing the procedures of earlier astronomers, Copernicus uses the very term *hypothesis* when insisting on the need for seeking true hypotheses in astronomy. "Therefore," he wrote, "in the process of demonstration, which is called 'method,' they are found either to have omitted something essential, or to have admitted something extraneous and wholly irrelevant. This would not have happened to them, had they followed sure principles [*principia*]. For if the hypotheses [*hypotheses*] assumed by them were not false, everything which follows from their hypotheses would be verified beyond any doubt."[19]

This brief passage embodies the new spirit of the scientific revolution. In saving astronomical appearances, one must not be indifferent to the truth or falsity of the basic assumptions or hypotheses. Only hypotheses corresponding to physical reality can yield further truths about the physical universe. We have already seen that most fourteenth-century scholastics remain content to construe the function of an hypothesis as that of "saving the phenomena" and are little concerned with truth. Buridan and Oresme, although differing radically in their respective approaches, agree that the earth's mobility or immobility is a matter of indifference for saving the *astronomical* appearances. Copernicus, in breaking with medieval tradition, insists that only one of these two hypotheses could be true and that he can indeed demonstrate its truth by the consequences which seem to follow from it.

Thus, by a logically untenable move, Copernicus launched the great quest for physical reality—a quest described by Pierre Duhem as a hopeless delusion. But this delusive quest was a siren which beckoned to those scientists most instrumental in engineering the scientific revolution. Kepler, Galileo, Descartes, and Newton were all to follow in the path marked out by Copernicus.

Kepler, for example, in a letter defending Copernicus remarked

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that "it is a most absurd fiction . . . that the phenomena of nature can be demonstrated by false causes. But this fiction is not in Copernicus. He thought that his hypotheses were true. . . . And he did not merely think so but he proves that they were true."[20] Galileo also shared this sentiment. In his *History and Demonstrations Concerning Sunspots,* he distinguishes between mathematical and philosophical astronomers, remarking that while the former use geometrical devices such as eccentrics, epicycles, and equants, "in order to facilitate their calculations," the philosophical astronomers abandon them and, "going beyond the demand that they somehow save the appearances, seek to investigate the true constitution of the universe —the most important and admirable problem that there is. For such a constitution exists; it is unique, true, real, and could not possibly be otherwise; and the greatness and nobility of this problem entitles it to be placed foremost among all questions capable of theoretical solution."[21] Again, in his *Dialogue Concerning the Two Chief World Systems,* Galileo asserts that Copernicus "very well understood that although the celestial appearances might be saved by means of assumptions essentially false in nature, it would be very much better if he could derive them from true suppositions."[22]

Galileo thought it necessary to seek physically true assumptions for terrestrial as well as celestial phenomena. In a famous passage introducing his discussion on freely falling bodies, Galileo in *The Two New Sciences* writes that "anyone may invent an arbitrary type of motion and discuss its properties; thus, for instance, some have imagined helices and conchoids as described by certain motions which are not met with in nature, and have very commendably established the properties which these curves possess in virtue of their definitions; but we have decided to consider the phenomena of bodies falling with an acceleration such as actually occurs in nature and to make this definition of accelerated motion exhibit the essential features of observed accelerated motions."[23]

Having elaborated the contrast between the medieval conception of the role of an hypothesis and that of Copernicus and his eminent successors, we may ask whether a genuine scientific revolution might have occurred in the Middle Ages—assuming for the moment that all the essential mathematical tools and physical concepts were available to medieval thinkers. I believe not. The emphasis on uncertainty, probability, and "saving the phenomena," with a concomitant disregard for underlying physical reality, reveal all too clearly a deep-seated sense of futility and pessimism concerning

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human ability to penetrate beyond what is empirically apprehended. Even those natural philosophers who may have believed that some understanding of underlying reality was possible were inhibited by the condemnations, which demanded of them an open-mindedness to a spectrum of ideas, none of which could vanquish its rivals in a world controlled by the unfathomable absolute power of the Creator. The open-mindedness fostered by the condemnations was stimulating, but in the final analysis there was a desperate need to narrow the range of possibilities until one was in a position to argue for concepts with all the single-mindedness, even the narrow-mindedness, required to gain acceptance for them.

It was this sort of narrow-mindedness which characterized the revolutionary work of Copernicus. It enabled him to focus all his energies in pursuit of the consequences of those indubitable truths on which his new cosmology rested. This is the great legacy of Copernicus to his illustrious successors, and it marks a dramatic turning point in the history of Western science.

References

1. Translation of Sir Thomas Heath, *Mathematics in Aristotle* (Oxford, 1949), p. 52.
2. *Ibid.*, p. 53.
3. The relevant section including the following excerpts may be found in Heath's *Aristarchus of Samos,* pp. 275-276. The entire passage is reproduced in M. R. Cohen and I. E. Drabkin, *A Source Book in Greek Science* (2nd edn., Cambridge, Massachusetts, 1959), pp. 90-91.
4. I have translated this passage from Duhem's French translation in his *Le Système du Monde,* (10 vols., Paris, 1913-1959), vol. 6, p. 616.
5. For example, in Ptolemaic astronomy the sphere of fixed stars has two motions, namely, diurnal and precessional, while in Aristotelian cosmology it has only a diurnal motion. See A. C. Crombie, *Robert Grosseteste and the Origins of Experimental Science, 1100-1700* (Oxford, 1953), pp. 97-98.
6. Duhem, *op. cit.,* vol. 6, p. 617.
7. Gordon Leff, *Bradwardine and the Pelagians* (Cambridge, England, 1957), p. 128.
8. *Ibid.*, p. 134.
9. Quoted in Julius Weinberg, *Nicolaus of Autrecourt* (Princeton, 1948), p. 120.

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10. Weinberg, *op. cit.*, p. 117.

11. The Latin text is quoted by Anneliese Maier, *Die Vorläufer Galileis im 14. Jahrhundert* (Rome, 1949), p. 101, n. 41. The translation is my own.

12. Translation by Marshall Clagett, *The Science of Mechanics in the Middle Ages* (Madison, Wisconsin, 1959), p. 536.

13. Buridan's discussion of the possibility of the earth's rotation has been translated by Clagett, *op. cit.*, pp. 594-598. The two quotations below may be found on pp. 595 and 596, respectively.

14. Oresme's final discussion of the rotation of the earth in 1377 as given in his *Le Livre du Ciel et du Monde* has been translated by Clagett, *op. cit.*, pp. 600-606. The passages quoted below appear, in order of quotation, on pp. 602-603, 603, and 606.

15. Alexandre Koyré, "Le Vide et l'Espace Infini au XVIe Siècle," *Archive d'Historie Doctrinale et Littéraire du Moyen Age*, 1949, *24:* 51.

16. Translated by A. C. Crombie, in *Medieval and Early Modern Science* (2 vols., Garden City, New York, 1959), vol. 2, p. 172.

17. *Ibid.*

18. From Book I, ch. 10, of the *De revolutionibus,* translated by Crombie, *op. cit.*, pp. 172-174.

19. Translated by Edward Rosen, *Three Copernican Treatises* (2nd edn. rev., New York, 1959), p. 28.

20. *Ibid.*, p. 24, n. 68. The passage appears in Kepler's *Opera,* ed. Frisch, vol. 3, p. 316.

21. Galileo Galilei, *History and Demonstrations concerning Sunspots and Their Phenomena* (Rome, 1613), translated by Stillman Drake in his *Discoveries and Opinions of Galileo* (Garden City, New York, 1957), p. 97.

22. Galileo Galilei, *Dialogue concerning the Two Chief World Systems—Ptolemaic and Copernican,* translated by Stillman Drake (Berkeley, California, 1953), p. 341.

23. *Dialogues concerning Two New Sciences by Galileo Galilei,* translated by Henry Crew and Alfonso de Salvio (New York, 1914), p. 160.

Comments by Benjamin Nelson

IT IS PRECISELY the originality of Edward Grant's paper that encourages me to present a number of far-ranging questions and proposals. My main theme will be that the pioneers of modern science

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and philosophy were intent on the abandonment of probabilism and the establishment of (subjective) certitudes based on (objective) certainties. Professor Grant suggests that the principal reason for the flowering of the doctrines of logical probability (loosely called probabilism) was the condemnation of 217 so-called Averroist propositions by Bishop Etienne Tempier in Paris in 1277. I wish I could agree.

Even though contemporary research in the history of the medieval logic and dialectic of decision (scientific and moral) is in its infancy, it may be safely said that the central clusters of concepts have their roots in antiquity and come to have a vastly expanded significance in the twelfth and thirteenth centuries. The importance of the idea of "the probable" in the *Summulae logicales* of Peter of Spain (Pope John XXI) in 1271 suffices to demonstrate that the emergence of this idea did not depend especially on the condemnation of 1277.

As I see it, the most important contexts in which the idea of probability originally developed were not those we today call cosmology and physics, but those traditionally known as moral theology and philosophy. The need of the great Forum of Conscience (the confessional) to evolve a comprehensive fabric of casuistry for the governance of all the cases within its sphere of jurisdiction, which in effect meant all human actions (especially mental acts), inevitably spurred its judges and its intellectual mentors to elaborate a dialectic of moral decision involving the articulation of the entire spectrum of intention, understanding, authority, circumstance, and so forth. The urgency of such a structure became especially marked after 1215, when the Fourth Lateran Council obligated every Christian to confession at least once a year. The details of this development of the interconnections of conscience, casuistry, and the cure of souls have not yet been adequately reported; but it is clear that within the thirteenth and fourteenth centuries every shade of conviction and evidence between certain knowledge and invincible ignorance was carefully examined, yielding multiple distinctions among ranges of certitude in the various spheres—speculative, practical, mathematical, physical, moral, etc.

There was indeed ample occasion for a crisis in the Church-centered culture over the question of "the probable" in the fourteenth and fifteenth centuries. We must recall that Luther hurled into the flames not only the *Corpus* of the canon law but also the so-called angelic *Summa concerning the Cases of Conscience* of An-

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gelo de Clavasio. However, it was only after the formal publication of the special thesis of the "lesser probability" (*minus probabilismus*) in the commentary on the *Prima secundae* of St. Thomas' *Summa theologica* by the Dominican, Bartholomeus de Medina, in the year 1577 that the debate over probabilism assumed vast significance throughout the entire Christian world, dividing learned scholars everywhere, whether Protestant or Catholic. The struggle over probabilism entered an acute phase as a result of the extraordinary expansion of the implications of the new emphasis ventured especially (but not exclusively) by daring Jesuit theologians and logicians. There was no aspect of action or belief which was not in one way or another affected by the crisis over probabilism. Even before the first quarter of the seventeenth century had ended, polemic over the probabilist system had broken out in all countries of the Catholic and Protestant world. Later, the popes (Alexander VII, Innocent XI) themselves felt summoned to seek to moderate the controversies by setting forth lists of condemned propositions said to be "excessively relaxed."

The most famous of the attacks on the ultra-probabilists is that of Pascal in his *Provincial Letters* of 1656-1657. We are reminded, however, that anti-probabilist writings occur long before Pascal. Perhaps the most searching of the logical and juridical investigations of probabilism was written slightly before Pascal by Prospero Fagnani.

These controversies over probabilism, I am convinced, are among the central contexts in which we must review some of the major emphases of the pioneers of early modern science and philosophy. I would put it even more strongly: Copernicus, Galileo, Descartes, Pascal, and other founders of modern science and philosophy (not excluding Newton) cannot be fully understood except in the light of the controversies (philosophical, theological, juridical) among probabilists and anti-probabilists on the nature of knowledge, opinion, certitude, ignorance, hypothesis, etc. The conventional descriptions of the founders of modern thought as skeptical nonconformists desirous of eradicating the superstitions of the credulous should be modified. Without exception, all the originators of modern science and philosophy were intent on establishing (subjective) certitudes on the basis of (objective) certainties, moral and physical as well as mathematical, and in overthrowing the probabilist "conjecturalism" of the learned.

In this light, many of the familiar references to probabilism and

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probability stand in need of correction. A striking illustration of this may be found in Norman Kemp Smith's commentary on the *Discourse of Method.* Descartes was not directing attacks against the mathematical theories of probability of Pascal and Fermat. Descartes had in mind the probabilist logic of his Jesuit teachers and innumerable scholars at the universities and elsewhere.

Whatever their hopes—whether they wished to advance pure science, logic, secular progress, true (primitive Christian or "natural") religion—the pioneers sought to establish new foundations for exact and compelling knowledge and belief. The prevailing probabilist dialectic that inhibited the quest for new data, the recourse to well-designed experimental research, strict logical proof, and mathematical formalization were inevitably a major target of the seventeenth-century "enlighteners."

There is still another perspective necessary for an understanding of anti-probabilism among the pioneers of modern science and philosophy. To a man, each was determined to clear away many confusing masses of plausibility and conjecture that had been allowed to obscure the certitudes delivered by the Book of Nature (Galileo) and the mathematical method (Descartes). Each in his own way had a horror of the concealments and accommodations of those who laid claim to authority in the world of learning.

It is difficult to resist venturing a general proposal concerning the relations between religion and the rise of modern science and philosophy. Contemporary discussions have given excessive attention to the importance of the "Protestant Ethic" in generating an atmosphere conducive to scientific investigation and technical achievement. When one looks closely at the data, it is apparent that we must evolve hypotheses that more correctly square with the fact that the major advances in experimental design and mathematical achievement originated in Catholic "culture areas," among Catholics who stood in various relations to their churches. It is only on some such hypothesis as suggested by W. Robertson Smith and others that we can make sense of the actual developments. According to this view, there is within the history of the various religious communities a continuing struggle between those who adopt or are assigned the perspectives and roles of "priests" and those who assume the perspectives and roles of "prophets." The "priests" (whatever their actual office, whether secular or religious) develop a tendency to conceal the arcana, to protect the holy deposit of truth, the sacred rites and precious utensils, from the obtrusive illiterate. Inevitably,

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however, they are driven to make complex adjustments to changing situations which are felt to be "correctly" appreciated only by those who have received proper accreditation in authorized schools and facilities. In such an atmosphere, demonstrable certainties are not to be had. This situation must not be obscured by the fact that ordinary believers are expected to have implicit faith in the doctrines proposed to them by their guardians.

At one time or another, almost inevitably, there appear those who insist on proclaiming a mighty certitude of their own, or on pointing to a certainty that appears to be clearly established by nature, history, a special revelation, or whatever. Within this setting, it may be held that Copernicus, Galileo, Descartes, Pascal, and a number of others, in their several ways, are expressions of Catholic "prophetism," as opposed to the conjecturalist plausibilism more characteristic of the groups having closer identification with the official religious Establishment.

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G. A. KURSANOV

Philipp Frank and His Philosophy of Science

The following article is a translation of the introductory essay for the Russian translation of Philipp Frank's *Philosophy of Science: The Link between Science and Philosophy* (Englewood Cliffs, New Jersey: Prentice-Hall, 1957), published in the U.S.S.R. as: Filipp Frank, *Filosofiya Nauki: Svyaz' mezhdu Naukoi i Filosofiyei* (Moscow: Foreign Language Press, 1960). The translation of the book from English into Russian was prepared by N. V. Vorob'yev, under the general editorship of G. A. Kursanov. The present translation of the introductory essay into English is by Alexander G. Korol, of the Massachusetts Institute of Technology.

THE AUTHOR OF this book is a colorful figure among contemporary bourgeois philosophers. Philipp Frank was one of the three principal speakers at the 1958 XIIth International Philosophical Congress in Venice, in the first section of the Congress, "Man and Nature." His philosophical views represent a characteristic yet original expression of the positivistic ideas now widely held in many capitalistic countries. For several decades he has been writing books and articles on the philosophical questions of modern science, particularly on the theory of relativity and on quantum mechanics. To all such questions he gives a "modern" positivistic foundation. In his handling of questions of physics and mathematics, it is understandable that Frank cannot help but express a number of materialistic positions which, in his view of the world, combine eclectically with idealistic views. This combination is often present in the viewpoints of positivist philosophers. In his *Materialism and Empirio-criticism,* V. I. Lenin commented on this fact in appraising the views of Mach and Poincaré.

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As is well known, contemporary positivism is an exceedingly prominent current of thought that presents itself under many guises and embraces a number of schools and currents in contemporary bourgeois philosophy. It contains not only the "logical atomism" and "physicalism" of the Viennese neo-Machists, but also semantic idealism, pragmatism and the so-called neutral monism—and all these currents mingle and crisscross one another.

In order to evaluate correctly all the forms and varieties of positivist philosophy, Lenin's profoundly analytical view of empirio-criticism as a variety of positivism is an indispensable guide. Lenin pointed out that behind all the "isms" and the various new terms and labels one must first recognize the subjectively idealistic content of positivism as a philosophy. He further pointed out that one must show the place of positivistic philosophy relative to other contemporary philosophical schools and to the natural sciences, as well as its connection with "physical" idealism. Lenin demanded that the reactionary political role of positivism and its subservience to fideism and religion be demonstrated by revealing the essence of the positivists' philosophical views. We need not emphasize that Lenin's critique of Machist philosophy has retained its total significance for evaluating the essence and the political role of contemporary positivism in all its variations.

There are indeed common elements in all the many currents and schools of contemporary positivism. As a rule, it gives a subjectively idealistic solution to the basic question of philosophy; it arrives at a negation of the cognition of the substance of things, acknowledging only the superficial phenomenological description of events; and it defends the subjective interpretation of experience. Positivism tendentiously utilizes the findings of contemporary science (physics, mathematics, and logic) in its attempt to create a homogeneous scientific basis for its assertions. Many modern positivists strive to provide a foundation for the new forms of a religious view of the world by developing the ideas of the so-called "natural," or "cosmic," or "mathematical religion." Because of positivism's incessant references to experiment and science, because of the skill of the positivistic philosophers in creating a semblance of "scienticity," and a "scientific" argument for their views, and because of the historical connection between positivist philosophy and the emergence of various physical theories, it still asserts a most subtle and corrupting influence on the viewpoints of the natural scientists, forcing them (as Paul Langevin picturesquely said once) to engage

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in "intellectual debauchery"—that is, in idealistically perverting science. Inasmuch as genuine scientists investigate objective laws and regularity in the development of nature, it is inevitable that their concepts represent mixed elements of natural scientific materialism, intuitive dialectics, and of course positivism—this being the most influential trend of contemporary bourgeois philosophy. In our opinion, the concepts of the world held by such great modern physicists as Einstein, Bohr, and Heisenberg—for all their peculiarities and differences—are of that character.

As for the basic question of philosophy, it must first be said that it has been characteristic of positivism not to face up to that question but to proclaim "neutrality" in the struggle between materialism and idealism, and even now to deny its importance and meaning. Though more than a century ago Comte did not deny the existence of the external world, he spoke of philosophy as powerless to solve the question of the reality of that world. More than half a century ago Machism (for all its claims to neutrality) offered its own obviously subjective solution. Today, Carnap, a major proponent of positivism, labels it a "pseudo-problem," speaks of its "absurdity," and, totally ignoring material reality, reduces the concept of philosophy to a formally logical system or rules—that is, to a purely formal science "abstracted from every object, from any content." Clearly, such attempts to negate the basic philosophical problem represent only a particular form of concealing an idealistic interpretation and solution.

Furthermore, the hypostatization of logical and linguistic operations in contemporary positivism (which perpetuates the old traditions of subjective idealism) leads to the so-called "logical structuring of the world." As early as 1928 Carnap clearly wrote to this effect in his book characteristically entitled, *Der logische Aufbau der Welt.* There he emphatically states that the issue is whether the structure of the world is made, not of real atoms and electrons, but of so-called "psychic elements proper"—that is, of man's subjective perceptions. One must note that Carnap's scheme and the analogous reasonings of the positivists on "constructing reality" involve an intentional switch between diverse concepts. In fact, it is man himself as the perceiving subject who creates and elaborates a definite view of the world that corresponds to a given level of scientific knowledge in a given historical epoch. It is even more evident that man attributes a definite logical structure to the given scientific view of the world and then abstracts this

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structure, analyzes its logical elements, establishes various connections and relations among them, and so forth. But this does not at all mean the creation of reality itself or of the actual world, as all positivist formulations imply—quite independently of what exactly they take to be the basis for such formulations, whether this is "logical systems," or "elements of thought," or "sensory elements of experience," or "neutral premises," or "proper [improper] psychic elements." Positivists invariably confuse the logical and ontological aspects: the logical aspect of cognition of the world, as a process, is equated with the process of "creating" the world itself—the "creation of reality." Thus the hypostatization of the logical and linguistic aspects of cognition reaches its limit: the creation of the entire material world in logic and in language is the limit of logic and language!

It is the hypostatization of the logical and linguistic aspects of cognition that appear to us to be the major epistemological position characteristic of contemporary positivism. Not only does the "logical construction of the world" follow from that position; so does the positivists' approach to the solution of all, or nearly all, philosophical questions. Hence they derive their conception of truth, in which the most important element is declared to be the logical connection among the various propositions, or even the terminological consistency within a given scientific system. Obviously, the decisive thesis—the objectivity of truth, and the only real criterion of truth, man's social practices—is wholly ignored. The entire conception of science as held by contemporary positivists derives from the same effort to assign absoluteness to the logical aspect of cognition. Carnap, Reichenbach, Wittgenstein, and others see in science first and only the "cognitive structure," a system of logical categories, consistency, order, relations of concepts and terms, even linguistic constructs that are only purely formal.

It is clear, therefore, that logico-linguistic schemes lead to an alienation from science. The objective content of science, the consequence of the laws and regularity of the material world as reflected in our consciousness, "vanishes," as does the objective content and the cognitional meaning of scientific laws, concepts, and categories. In the end, the very connection among these loses all sense because of excessive formalization, and thus it also vanishes. Similarly, all the heuristic importance of scientific propositions and the practical application of science to the various aspects of man's social life disappear as well. Man's mastery over nature, as Lenin

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repeatedly stressed, results from the objectively correct reflection in man's mind of the laws governing the development of nature. To ignore or deny the creative vitality of the objective content of science is in fact to negate science and destroy it.

On the same plane, one should also examine the positivist arguments as to the most appropriate and preferred system of rules and terms setting up the least number of principles—that is, the most "economical" and therefore the truest system. This is not a new, but an old, positivist thesis elaborated by the Machists, whose falsity, as we see, is wholly demonstrable in the light of modern science.

Related to all such positivist positions are their discussions on the so-called operational nature of human knowledge. The sense of scientific concepts, conclusions, and theories is reduced to a system of consecutive operations performed by the perceiving subject. In the course of a scientific investigation, the scientist does indeed perform a series of operations, both experimental—including measuring operations, extremely important in physics, for example—and mental operations, without which research is impossible. But is that all there is to the significance and meaning of scientific concepts and theories? Does this mean reducing the significance of Newton's theory of gravitation or Einstein's general theory of relativity to those mental operations performed by the authors of those theories? If so, what becomes of their objective meaning, their enormous heuristic value, their profound and comprehensive relevance to the most diverse areas in man's existence, including the utilization of atomic energy and now the cosmic flights? Once again we are confronted by the assignment of absoluteness to only one of the aspects of a complex and rich process of scientific cognition and by the total neglect of all other aspects that wilfully disregards the main point: the reflection of the objective content of material reality itself in scientific theories and concepts, through which their meaning and applicability to man's usage are wholly determined.

One must make the following comment, however. Modern positivism makes an exceedingly wide use of mathematics and logic in its constructs. As in all the above instances, positivism is in error whenever assigning absoluteness to logico-mathematical categories and operations is concerned. Per se, the use of mathematics and logic and the striving to develop a logico-mathematical foundation for various aspects of knowledge are not at all wrong. Moreover, the development of mathematical logic (on which contemporary posi-

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tivists, especially the semanticists, rely in so many ways) has been of great scientific importance, for example, the enormous role of mathematical logic in cybernetics. At the same time, we are reminded that the creation of mathematical logic is not at all the achievement of contemporary positivists, though they often lean on it, use its positions, and at best lend it a certain systematization, as Carnap has done in certain works such as *The Formalization of Logic* (1943) or *Einführung in die symbolische Logik* (1954). As a matter of fact, even Leibnitz advanced the foundations of mathematical logic, as did Boole, Morgan, and later the mathematicians Frege, Gilbert, Kolmogorov, Novikov,* and others. There is no question but that Russell and Whitehead's *Principia mathematica* (1911-1913) played a definite role in developing mathematical logic, but even in that work the authors proceed from Leibnitz' scientific ideas.

Frank's philosophy of science, which is definitively and amply expressed in the *Philosophy of Science,* can be more clearly and accurately evaluated in the light of positivist positions cited above. Let us first examine Frank's position with respect to the basic philosophical question and to the other philosophical problems immediately related to it. In his preface, he at once sets aside the "historical types of philosophy, as idealism and materialism," and introduces the idea of the existence of some third and differing view, the position from which he himself speaks. In his paper presented at the Congress in Venice in 1958, he begins by enumerating the various philosophical systems (materialism, idealism, realism, organicism), which he evaluates in connection with the "religious, moral, and political doctrines" they have served to reinforce.[1] Frank's own philosophy apparently has no relation to any of these. He also declares that modern science, in particular physics, "tells us nothing about either 'matter' or 'spirit,' but has much to say about semantics"![2] Moreover, he concludes his paper by asserting that all attempts to support either the "materialistic or spiritual systems" on the basis of twentieth-century science "have proved futile."[3] Here we note again Frank's desire to dissociate himself from the two principal doctrines of contemporary philosophy. We are not referring here to the total falsity of his assertion that even materialistic philosophy receives no confirmation from modern science. On

* Andrei N. Kolmogorov (born 1903) and Pyotr S. Novikov (born 1901) are both Soviet mathematicians (transl.).

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the contrary, the entire development of contemporary science, especially physics, deeply reveals the objective dialectics of nature and thus gives us new convincing proofs of the truth of the scientific, dialectic-materialist view of the world.

In the present book Frank develops the same position. He asserts that neither materialism nor "antimaterialism" is connected with science and its achievements, but that both derive from "social, political, and religious objectives." His obvious aim in this assertion is to reserve science for his own philosophy, positivism—the only one, we are asked to believe, that can be called a scientific philosophy. Correspondingly, Frank relegates the very concepts of "matter," "consciousness," and "cause and effect" to the language of everyday common sense and declares that they "have no place in strictly scientific discourse" (p. 45).*

Instead of leading to any "new" philosophical doctrine, this hostility to materialism leads to conclusions of an idealist-religious cast. Frank maintains that it is senseless to try to understand the essential nature of objective phenomena, without having a purpose in mind, which "will emerge by itself." Given, for example, an object created by man, its essential nature, he argues, is determined by the purpose men set for it. Hence, it follows that we can speak of "the essence of a natural object, a stone or an animal or a human being, only if we assume that their *maker had a definite purpose in making them*" (p. 8—italics G. A. K.). The question then is, where is the "neutrality"? Where is Frank's "antispiritualism"? Where is there any "originality," even a superficial one? It is already clear that what we have here is the typical idealistic-theological assertion that Frank applies to the concept of the *essence of things*—that is, he offers a completely definite solution for the basic philosophical question by affirming the idealistic substance of the world.

It is significant that Frank clearly and unambiguously reveals his philosophical sympathies—a fact that also shows the real character of his philosophical credo. For Frank, the highest authorities are Whitehead, Reichenbach, and Mach. He refers to Whitehead as "one of the greatest twentieth-century philosophers" (p. 25). Mach for him is a "most powerful figure" (p. 319) among scientists with "positivistic leanings" in the entire span of the late nineteenth and early twentieth century. For Frank the positivist discussions

* This page reference and others in the text refer to the English language edition of Frank's *Philosophy of Science*.

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of Reichenbach, and not those of the mathematical scientists, constitute the highest formulation of the theory of probability. He also speaks, not without piety, of the reactionary Spanish philosopher, Ortega y Gasset, of Thomas Aquinas, Plato, and Pierre Duhem. He also alludes, though in an entirely different tone, to the creators of the genuinely scientific philosophy of dialectical materialism, and in so doing, he betrays a total lack of understanding of the substance of dialectical materialism.

What ideas, then, does Frank develop on the philosophical questions of science? Above all, what are his views on the relations between philosophy and science and on their mutual influence on the process of man's cognition of the complex and contradictory regularities of the material world? In examining these questions, we must give the author due credit, for, in developing his philosophical position, he marshals extensive scientific materials from various branches of knowledge. In particular, he devotes an extensive analysis of the achievements of modern physics and mathematics, comparing them with classical physics and Euclidean geometry, and attempts to make these achievements substantiate his positivistic views.

Like all positivists, Frank begins by pointing out the connection between philosophy and science. He says repeatedly that fundamental changes in science have always been accompanied by intensive exploration of its philosophical foundations; that to understand twentieth-century science it is particularly necessary "to absorb a good deal of philosophical thought" (p. xii); that the deeper we dig into actual science the more its links with philosophy become obvious" (p. iv). Frank makes use of corresponding pronouncements on the part of Einstein and de Broglie, in which the great importance of a philosophical analysis of the problems of science is underscored. Moreover, he complains that university graduates become the "captives of obsolete philosophies" (p. xviii), because the teachers of science dissociate themselves from philosophical questions. In his opinion, it is the positivist interpretation of scientific problems that can deliver scientists, young or old, from such an imprisonment.

Frank affirms the existence of a break between science and philosophy, the so-called missing link which in the interest of both science and philosophy, must be reconstructed at all costs. To do that one must first reforge the link between the two. According to Frank, science is at one end of the chain, and philosophy at the

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other. Thus science is seen as a system of principles based on direct observation, while philosophy expresses general principles conceived by mind. The problem is how to join these two extremes: what must serve as the connecting link between them so as to assure a unified scientific understanding of the world and of the process of cognition? It is the "philosophy of science" that must answer these questions.

To Frank, the central problem of the philosophy of science is the relation of direct experience, everyday common-sense experience, and general principles. How does a transition from one to another occur? What is the meaning of general principles, both in science and philosophy? His preliminary answer states first that progression along the chain of "science-philosophy" moves in the direction of propositions of a more and more general and abstract nature, and that these propositions become less and less exclusively determined by direct observation; and second that these propositions become less and less certain (p. 2 passim). In this argument, Frank is right in a way as to several details. Scientific concepts of a high degree of abstraction, as Lenin points out, are generally "devoid of sensory content." Taken as a whole, however, Frank's argument is totally without merit. The entire history of science convincingly shows the great heuristic value of the most general concepts, for the precise reason that they reflect reality more deeply, more fully, and more correctly. This fact also explains progress in developing human knowledge, progress in creating and developing scientific theories and concepts of an ever greater degree of generality, of an ever greater degree of certainty—contrary to Frank's assertions.

Frank's interpretation of the sense and meaning of the most general principles of science and philosophy is quite contradictory and does not follow from the premises. On the one hand, he advances a number of correct propositions as to the role of experiment and direct observation in formulating the general principles and laws of science. Among the latter he includes so-called "statements of intermediate generality—Ohm's law, Newton's law of gravitation, the laws of thermodynamics, Mendel's laws of heredity" (p. 22). He also speaks of a number of other scientific laws being based on corresponding factual or experimental data that "constitute the foundation of science." Frank justly refers to Francis Bacon, who has demonstrated the exceptional importance of inductive methods for new science, and he is also in complete agreement with Bacon in criticizing the bankruptcy and empty abstractness of medieval

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science. All these views unquestionably belong to the positive aspects of Frank's book.

At the same time, however, he advances a whole series of contradictory arguments as to the sense and meaning of the general principles, laws, and concepts of science. Thus he categorically states that science in essence consists of general principles that are wholly distinct from everyday common-sense experience. In physics as a whole, he states, only the abstract scheme has real significance* and that significance is fundamentally distinct from any analogies with observable facts. "Simple mathematical formulas" from which observable phenomena can be derived also acquire a self-sufficient meaning (pp. 8, 14, 21). In general, many principles of science cannot be proved by virtue of their self-sufficient meaning. In that category of principles Frank includes the principles of causality and of sufficient reason: to verify these by experiment is "hazy and complicated," whereas their importance lies in the fact that they are "self-evident" (p. 17). He often denies the importance of direct inductive observations for forming general conclusions, and he even states that general principles "may come to one in a dream"!? In any event, one can *believe* that "such principles exist" (p. 44). It should be noted that such assertions of Frank's not only directly contradict the self-appointed task of clarifying the nature of general principles, but that they also mean the turning away from a scientific examination of this problem, from an analysis of the problem of the "philosophy of science" to which Frank's entire book is devoted.

In the same sense, his assertions that the principles of science must possess *simplicity* are also devoid of substance. He states that "if the principles we set up are as complicated as experience itself," they do not constitute a science (p. 42). Moreover, "if there is not a small number of principles, if there is no simplicity, there is no science"! (p. 43). Here Frank obviously confuses separate points. It is true that every investigation and the formulation of its results cannot but result in a certain blunting and simplification of reality —for the nature of reality always remains infinitely more complex and contradictory. But it does not follow that simplicity is a criterion of a principle's being scientific. On the contrary, the study of the ever more complex phenomena of the world about us inevitably demands equally complex forms of man's mental process (including

* The reference here seems to be to Frank's sentence: "What really matters in physical science is the abstract scheme" (p. 8).

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principles, concepts, and theories), in order for the real laws and regularity of the world to be reflected in consciousness to the maximal fullness and depth. The complex scientific systems of modern quantum mechanics, the equations of mathematical physics, the various theories of the elementary particles of matter—all these clearly show that what matters is not "simplicity" but the degree and depth to which the laws of matter in motion are reflected in the concepts of contemporary theories.

Frank's reasonings on the role of deduction and induction in formulating scientific systems are also contradictory. He properly states that "in actual practice science has always made use of both induction and deduction" (p. 298). As already noted, he demonstrates the role of inductive observations and generalizations in the development of certain scientific principles. He also speaks of the importance of deriving logical conclusions from the general principles of science; he demonstrates the importance of new concepts in the development of science; and the importance of general (including mathematical) formulas and equations for analysis and even for the discovery of new specific facts. Frank rests his argument here on the actual course of development of the scientific cognition of the world, especially in physics; but even here he advances a number of invalid, idealistic, and metaphysical arguments. He asserts that "the direct building materials of principles are *words*" (p. 301) and also mathematical formulas and the rules of syntax or deductive logic (p. 301). Hence it follows that the task of science is "to infer from the observational material the general principles that are *made of symbols* and connected by logical operations" (p. 301. Italics by G. A. K.). It is by such means that the creation of the necessary structure of "linguistic material," which here determines the basic content of science, will be achieved.

Let us also note Frank's wholly incorrect view of the superiority of the Copernican over the Ptolemaic system, in that the Copernican rests on its greater mathematical simplicity, elegance, and greater utility for subsequent generalizations—that is, on its logical, even "esthetic," qualities, and not on its objective truthfulness. As already noted, both words and symbols do constitute an indispensable element in scientific systems and research; but they are merely *forms* that express the corresponding *content* of our ideas, which in turn represent the reflected content of material things themselves. In the same way, logical operations (the mutual linkage of ideas, definitions of concepts, derivation of correct conclusions, formula-

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tion of scientific systems, etc.) are also an inseparable component of a scientific investigation; but these are absolutely not the main content of science. They should be regarded as the necessary components of scientific research and as possessing auxiliary importance but in no way determining the content, sense, and meaning of scientific systems and doctrines. For this reason, the "linguistic material" of science and the various logical operations cannot serve as a basis for deriving scientific principles: they serve science only as an auxiliary means.

In this connection it is characteristic of Frank that he assigns the highest authority to John Stuart Mill and William Whewell, who, as he says, gave "a hundred years ago, more thought to the problem of 'induction' than any of their contemporaries" (p. 303). Both the logicians cited certainly contributed definite ideas to the development of inductive methods, but not all their positions by any means are scientifically based, let alone, in the light of modern scientific data. In actuality, of course, the genuinely scientific exposition of the problem of deduction and induction was contributed by Marx and Engels, who revealed the interconnection of these methods of scientific investigation and demonstrated their deep link with human practices and the achievements of science. Yet Frank, true to his "objectivity," again wholly ignores the work of the creators of the fundamentally new philosophy of dialectical materialism, which provides a new solution for all basic problems in the theory of cognition and the methods of scientific investigation.

Thus Frank's general conception of the philosophy of science is characterized first by idealistic and metaphysical traits, but it also contains a number of isolated correct positions, formed from factual scientific material. His book pays a great deal of attention to the question of the validity and value of scientific theories, that is, to the problem of determining and verifying their truthfulness. Here, too, the contradictions in the author's views are evident, but again, what predominate are his positivistic ideas. Nevertheless, he expresses a correct position on the necessity of verifying various scientific theories by facts. For example, he states that the laws of mechanics must relate to material objects and correspond with them. Certainly, physical laws and theories ought to be interpreted on the basis of physical facts. Frank examines in detail how the various theories of light were confirmed. First he discusses Arago's experiment, though as yet this has failed to confirm the validity of any theory. Then he stresses the importance of Philipp Lenard's ex-

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periment that confirmed the corpuscular theory and disproved the old wave theory of light. Here Frank justly rates Lenard's experiment as "a second crucial experiment" (p. 197). He states further that by experiment it is possible to verify, not simple assertions, but an entire system consisting of general principles, assertions as to various phenomena, etc. While he evaluates the geometric systems in particular, Frank's reasoning is correct in saying that these can be verified only with respect to one or another physical interpretation. Yet in the same passage he declares that "the formalized system of geometry does not tell anything about the world of physical experiments, but consists of 'arbitrary' definitions" (p. 81). In this understanding of the nature of geometrical systems, Frank fully agrees with Henri Poincaré, known for his development of the conventionalistic view of geometry (pp. 158-159). Here we must remind the reader that David Hilbert, who is an outstanding mathematician, and who devoted an extended discussion of the foundations of geometry in his classical work, *The Foundations of Geometry*, points out that each one of a group of axioms "expresses definite, interrelated basic results of our experience."[4] Thus the rational construction of various geometric systems is possible only on the basis of the axioms obtained—in the final analysis, from experience. This is what determines their validity and objective truth. Yet the conventionalistic viewpoint logically and inevitably leads to subjectivism and arbitrariness in the formulation, selection, and definition of [Euclidian and non-Euclidian] geometries.

Frank, however, as is typical of the spirit of positivism, assigns an incomparably greater significance to such criteria of the truth of scientific theories as "economy" and "simplicity." Above all, he declares that the actual advance of science has always been engineered by a criterion of economy and simplicity. Moreover, in the history of science, he attributes the introduction of these criteria to Mach and—to Newton! As to the first, there is no argument; but as to the second, such an attribution is simply false, for the entire spirit of Newton's natural philosophy is saturated with the idea of a profound connection between theoretical propositions and factual data derived from observation and experiment. Newton was a determined enemy of any contrived and artificial hypothesis not based on actual facts, and for him such facts are the criteria of the validity of theories. When Newton speaks of the elegance of mathematical expressions, he speaks about the outward form in which the laws of nature are expressed, not at all about the criterion of truth.

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Since Frank is apparently aware of the total scientific feebleness and vagueness of his criterion of "simplicity," he raises the question of the very concept of "simplicity" and of the degree of "simplicity" and comes up with this. He first advances the criterion of "mathematical simplicity," but he is soon forced to note that this criterion is a relative one, for, as he states, "how we judge the mathematical simplicity of a theory depends on the state of science at a certain period" (p. 351). Further on he examines the "easiness," the "economy," the "elegance and beauty" of theories as the expression of their "simplicity." He also notes their relative and conditional character. At last he "finds" the key to the definition of theories and the criteria of their simplicity: the "dynamism" of theories. That theory is to be preferred which makes "science more 'dynamic,' more fit to expand into unknown territory" (p. 352).

Undoubtedly, the possibility of generalizing theories further is important to the historical progress of science. But what has this to do with "simplicity"? The category of "simplicity" as a characteristic of a theory does not emerge from such a fact as this, that Einstein's theory of gravitation is a generalization of Newton's theory. Similarly, the construction of the single-field theory cannot justify the property of simplicity as the criterion of the validity and preferability of the relativistic theory of gravitation. When we pass on the validity of a theory, what always plays the determining role is how that theory corresponds to the objective laws and regularities of the material world. And this correspondence is ascertainable from all the multiform aspects and manifestations of man's activities. As to the simplicity and elegance of this or that mathematical expression, these may or may not be in evidence, for the objective content and the objective truth of the theory are wholly independent of them.

Finally, the author's typically positivistic position as to the criteria of validity is clearly and "simply" expressed in the following revealing admission. He asks, which criterion is the more important: "agreement with observation," or "simplicity"? And he answers: "The value of a theory consists, obviously, in its property of being simpler than a mere record of observations" (p. 353). Thus, of his own two criteria, Frank explicitly prefers the notorious positivistic "simplicity."

We note further that the inconsistency and eclecticism of Frank's views are also shown by the fact that he is ready to recognize both the pragmatic criterion of the value of theories (their purpose or

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usefulness) and also, like Reichenbach, the criterion of probability, which in essence signifies an agnostic denial of the possibility of valid cognition and of verifying and confirming cognition.

Thus briefly stated, these are in general the basic positions and tenets of Frank's philosophy of science, which he specifically tries to apply to the evaluation of the two most important modern physical theories: quantum mechanics and the theory of relativity. Let us examine some of the most important points in Frank's views on these topics. In chapter 9, "The New Language of the Atomic World," and chapter 10, "Metaphysical Interpretations of the Atomic World," he expresses various contradictory and inconsistent ideas as to the nature of microphenomena and quantum mechanics, which describe the laws and regularity of motion of matter in a microcosm. In this instance he states correctly that "wave and the particle pictures" may express definite aspects of "the objective physical world" (p. 229). He opposes drawing a sharp contrast between the world of classical Newtonian physics and the world of quantum mechanics. It is not true that only the latter can be explained in the sense of "interpretation," that is, by regarding "gravitation," "inertia," etc., as concepts that are analogous to spiritual powers. Newtonian "mechanistic" physics, if desired, can also be interpreted in that sense. But, states Frank, "there is no argument to show that they [classical and modern physics (G. A. K.)] must be" interpreted in this way (p. 236). Later he expresses the interesting view that various statements of the type, "recent advances in physics have introduced mental factors into science," or "modern physics justifies the doctrine of free will," are of relevance only to the metaphysical interpretation of theoretical physics, not to physics as a science (p. 237). A highly significant admission!

Frank makes yet another characteristic admission. In one place he writes, "Contemporary physics lends itself to a metaphysical interpretation, according to which the hydrogen atom is the product of spiritual powers and the electron jumping from one orbit to another carries out acts of free will" (pp. 237-238). Later, however, he excludes the question of free choice from physical determinism and relegates it entirely to the competence of scientific psychology—which for Frank, however, means Freud's "depth psychology"! In fact, what we find is, not a calm, logically consistent development of ideas, but a hurdle race, with vacillations and 180-degree turns at almost every step. Such, it would appear, is the "iron logic" of positivism.

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The central philosophical problem of quantum mechanics, as we know, is the problem of causality, round which two opposing philosophical camps have become clearly established. Again, Frank's position as to this problem is also deeply contradictory, though he does attempt a thorough development of its origins in several chapters, particularly in chapter 11, "Causal Laws," chapter 12, "The Principle of Causality," and chapter 15, "Theories of High Generality."

Here we must give due credit to Frank's views. In analyzing various aspects of the problem of causality in quantum mechanics, on the basis of its concrete results, he expresses a number of correct materialistic positions. In the first place, he states repeatedly that the so-called "uncertainty principle" in quantum mechanics has nothing in common with subjectivism. When we say "uncertainty," Frank says, we have in mind not the subjective consciousness of the observer but "the margin within which the coordinate of a particle would be contained if we described the observable facts in terms of particles" (p. 210). To him, uncertainty means that the future development of the world is determined in a most complex manner —nevertheless it is determined. Of this he has no doubt! "What matters is not *that* the future is determined, but *how* it is determined" (p. 262). It is clear enough that he admits that determinism, as viewed by Laplace and Newton, is not adequate for modern science. Frank criticizes neo-Kantian philosophy, including that of Rickert, who denied the causal relation of historical events. Frank states that in the total world process a multiformity of various causal cycles and subcycles are present, affecting both historical and social events. In such events, however, the causal relations are distinct from the corresponding relations in the meteorological, or aerodynamic, or molecular, or subatomic states (pp. 285-286).

Carrying his discussion further, Frank compares "causal" and "statistical" laws. First he notes a definite distinction between them. In the operation of the ordinary causal law, the situation is fairly simple: if we know the initial conditions, we can always predict the result. For statistical laws, "the situation is a very complex one." If we take the classic coin-tossing experiment, we must take into account the fact that in its path through the air the coin collides at irregular speeds with an enormous number of particles of air. "In this case we cannot predict anything about the values of the state variables at a certain time, but only about a certain average behavior" (p. 295). But this conclusion does not mean that the ex-

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ample lacks definite causal relations. The motion of the coin is subject to the same mechanical laws as govern the motion of a material point in the case of ordinary causal laws. Here, Frank states, the cause is the method by which the coin is tossed, and the "effect" is the frequency with which "head" or "tails" occurs. To Frank this is what constitutes both the distinction and the similarity of "causal" and "statistical" laws, and these two types of laws must not be considered incompatible.

In his special examination of "The Role of Causality in Twentieth-Century Science," Frank comes out against the direct denial of causality in atomic physics, found in "the writings of biologists, psychologists, sociologists, philosophers, lawyers, physicians, and especially in the sermons of clergymen and the speeches of politicians" (p. 342). He discerns a distinction between the old mechanistic principle of causality and the new regularities and causal relations that derive from quantum mechanics. This distinction is expressed in the new concepts, axioms, equations, and symbols used in quantum physics. His analytical evaluation of Schrödinger's wave equation is especially important, for he regards this as "a form of causal law" because its central concept is the function ψ which is subject to this law (pp. 345-346). What is involved here, he notes, is the determination of statistical averages, as distinct from the results of the ordinary causal relations in classical physics. In conclusion, Frank cites a demonstrative statement of Niels Bohr in his *Discussions with Einstein*, a statement with which Frank fully agrees: "The viewpoint of complementarity may be regarded as a *rational generalization of the very idea of causality*" (p. 348—italics by G. A. K.).

Here again one cannot help pointing out the inconsistencies and contradictions of Frank's judgments. He notes that even Laplace introduced the concept of Superior Intelligence in formulating his universal principle of causality. Neverthless, Frank continues, Laplace considered it only a convenient means of expression which could well be disregarded. Yet that is not so easy as it appears, writes Frank (p. 268)! Therefore, all the contradictions of the principle of causality can be "better" and "more simply" explained by the aid of a supreme (that is, divine) mental power. Thus, Frank arrives at the following conclusion: the question as to whether the law of causality is preserved in twentieth-century atomic physics cannot be answered by a simple "yes" or "no" (p. 348). Much of that formulation, of course, refers to the very concept of causality; but

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the author's repeated adherence to it testifies to the inconsistency of his views on this exceedingly important philosophical question in modern atomic physics.

Even greater contradictions are to be found in Frank's views of the philosophical questions in the theory of relativity, to which his chapters 5, 6, and 7 are devoted, and also, indirectly, chapter 3, which deals with the problems of geometry. Frank's paper delivered at the 1958 Congress likewise pays considerable attention to these questions. We must point out a number of correct ideas in his evaluation of the theory of relativity and of its particular points. First, the author is absolutely right to underscore the great philosophical importance of the new discoveries of modern science and to speak of the importance of the philosophical approach to science itself and of the great influence of philosophy on man's behavior. As he points out, these facts must not be ignored by the physicist, whether he is a scientist or a teacher. In a number of cases Frank opposes various idealistic interpretations of and conclusions from the theory of relativity. For example, he is opposed to the phenomenological viewpoint, which holds that the theory of relativity only "describes" facts and events, but does not "explain" them, as if in general it were not a "physical theory." He speaks of the incorrectness of the subjective point of view, which in the theory of relativity, for example, holds that the determination of "length" and "time interval" depends on the observer. He devotes a number of pages to demonstrating the inadequacy of direct idealistic conclusions from the theory of relativity—such as are drawn by the American biologist E. W. Sinnott and the scarcely unknown Pitirim Sorokin (pp. 174-176).

To continue, an awareness of the inadequacy of the old traditional concepts of physics in relation to the new discoveries and new concepts of twentieth-century physics (above all, to the theory of relativity) clearly emerges in all Frank's deliberations. In that connection he propounds a very important question: "In what sense does the theory of relativity refute materialism?" (p. 181). Frank's answer is characteristic: he says that it is only in one certain sense that "we must understand the statement that the relativity theory has refuted materialism" (p. 182), namely: that the theory of relativity has radically altered the concepts of classical physics (pp. 181-185). Frank views this transformation as a denial of the common sense on which the concepts of the nineteenth-century physics were founded. In the meantime, he states, the concepts of modern physics,

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above all the theory of relativity (for example, the concept of a four-dimensional continuum) departs from the domain of common sense and sensory concreteness. As is to be expected, Frank does not carry his arguments to a logical conclusion, he does not show that it is mechanistic materialism which proves to be bankrupt in the light of modern physics—on the contrary, the fact is that modern physics entirely confirms dialectical materialism. Nevertheless, his deliberations on modern physics contain certain rational points. These deliberations also testify to the inadequacy of direct idealistic conclusions from the theory of relativity—the point he often underscores.

In our opinion, Frank justly opposes the unfounded accusations of "dogmatism" leveled against the theory of relativity. These accusations were made by certain German physicists during the years of fascism in Germany, when the theory of relativity was officially declared to be "non-Aryan" and Einstein, its creator, was subjected to persecution and anathematized. Thus the German physicist Stark declares that the theory of relativity is a typical example of dogmatism, for the simple reason that it derives from two "dogmas": the relativity principle and the constancy of the speed of light. Moreover, we are told that these "dogmas" are forced on scientists by some sort of ruling power, "as occasionally political or religious dogmas have been forced on people" (p. 187). Here Frank justly says that the very same unscientific and malicious attitude was shown toward Einstein and his theory by the "ruling party" under the Nazi government in Germany, when scientific arguments were settled not with reference to truth but to the "racial differences between scientists" (p. 188). As to the theory of relativity being accused of dogmatism, Frank correctly notes that in a certain sense every theory is "dogmatic," inasmuch as it derives from certain principles and postulates. In that respect, the theories of Newton and Einstein do not differ.

Nevertheless, we cannot agree with a number of positions Frank takes in his evaluation of the theory of relativity. While correctly noting the enormous importance of the relativity theory for the construction of the edifice of twentieth-century physics, he nevertheless states that the goal of science in the twentieth century has been to *build up a simple system of principles* from which the facts observed by twentieth-century physicists might be *mathematically* derived (p. 134. Italics by G. A. K.). Einstein had the same aim in evolving his theory. This is a typically positivistic position on Frank's part, and

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he develops it rather consistently. As he sees it, the objective in developing the ideas of the theory of relativity is "the formulation of general physical laws in a simple and practical way" (p. 143). It is in this manner, according to Frank, that the principle of relativity itself should be formulated—as well as such special concepts as "real length" or "absolute length." The criteria of "convenience and simplicity" also play a decisive role in the new definition of mass in the theory of relativity; this definition, Frank states, should be declared "the legitimate heir" (p. 147) of the Newtonian definition of mass. For Frank the entire meaning of Minkovskii's four-dimensional formalism is only that it provides "a simpler and more elegant" (p. 161) method of expression. Consequently, the principles and concepts of the theory of relativity do not and need not have any objective meaning—they must only be "simple, useful, and convenient." Moreover, Frank almost completely ignores the great importance of *the experimental basis* of the theory of relativity on which the two basic propositions of the theory of relativity also rest, since they derive from nothing less than the repeated generalization of experimental data. This interpretation has been excellently presented by the eminent Soviet scientist S. I. Vavilov.[5]

Furthermore, we clearly cannot agree with Frank's assertion that physically observable facts should be mathematically derived from "a simple system of principles." In the light of the data of modern physics—allowing that it makes use of complex and refined mathematical apparatus—such assertions of Frank's, obviously of a Kantian character, cannot withstand criticism, inasmuch as modern atomic physics itself derives above all from observed data and the newest experiments, which are based on advanced modern technics of material production. The actual interdependence of principles, facts, and mathematical apparatus in modern physics is the inverse of what Frank declares it to be.

We also disagree with a number of Frank's points on the theory of relativity and related questions. Thus Frank asserts that " 'materialism is refuted' if we mean by 'materialism' the opinion that matter, in the common-sense meaning of the word, has filled the Universe since eternity and will remain for eternity" (p. 183). How, we must ask, has materialism been refuted? Perhaps he has in mind the groundless conclusions frequently drawn from the theory of relativity that the world is finite in space and time? If so, one should analyze the entire structuring of the cosmological problem implied by the Einstein theory, clarify the rational elements of that

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structuring, and give a critical analysis of the latest findings of science and the latest formulations of this problem in the works of the most outstanding modern scientists.[6] Nevertheless, nothing of the sort is found in Frank's work. We are therefore forced to view his assertion as dogmatic and unfounded from beginning to end.

One also cannot agree with Frank's assertion that the theory of relativity "proves" * that the "conservation of matter no longer holds; matter can be converted into nonmaterial entities, into energy" (p. 177). It is true that he does not consider that in connection with the theory of relativity this "fact" refutes materialism, but in itself his assertion is absolutely incorrect. It has been repeatedly demonstrated (again, in the most convincing manner by S. I. Vavilov) that no "disappearance" of matter whatsoever derives from the formula $E = mc^2$. This formula states that every process involving a change of the mass of moving bodies inevitably brings about a corresponding change of energy. Mass and energy, these most important properties of bodies in motion, are inseparably interrelated, and Einstein's formula gives the quantitative expression of this relationship. As to the law of the conservation of matter and motion, it is common knowledge nowadays that this has received new and brilliant confirmations in modern atomic physics and nuclear engineering.

Finally, we must note the total insubstantiality of Frank's assertions as to the attitude to the theory of relativity in the Soviet Union. In his book Frank alleges that in Soviet science and philosophy the theory of relativity is deemed to be an idealistic and therefore "a reactionary theory" which leads toward "undesirable political conduct" (p. 178). In his paper presented at the 1958 Congress in Venice Frank expressed himself in an even more "decisive" form when he declared that in Soviet philosophy the theory of relativity is rejected for being idealistic and in contradiction to the prevailing "political philosophy." More than once he ranks Soviet philosophy with Thomism and scholasticism—as he himself refers to it.[7]

In all candor we must admit that occasionally negative views on the questions of the theory of relativity did appear in our press at one time. But first of all that stage of history is long past; and second, all or nearly all Soviet philosophers, now or in the past, in discussing this theory, always assign an exceptionally high value to its heuristic

* Frank's full sentence began: "The antimaterialistic interpretation has won ground by the argument that in the theory of relativity the conservation of matter no longer holds. . . ."

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importance, while noting its great role in the development of all modern physics. As confirmation, we cite only two facts. In 1951-1955 the journal *Voprosy Filosofii* conducted a special discussion on the theory of relativity, in which many prominent scientists as well as Soviet philosophers took part. Without touching on individually advanced positions (discussion is discussion), let us recall that in the summary article it was clearly and incisively stated that the theory of relativity is "a great discovery of modern natural science," a "modern physical theory of space and time," one "of the foundations of the modern theory of elementary particles. It also provides a physical foundation for new fields of engineering."[8] This has come to express the general point of view on the part of the philosophical community of the Soviet Union on the role and significance of the theory of relativity.

The second fact is that the All-Union Conference on the Philosophical Questions of Natural Science was held in Moscow in 1958.* At that conference, in connection with a special paper on the philosophical foundations and meaning of the theory of relativity, an interesting discussion also developed, in which the participants, without agreeing in everything, gave a philosophical interpretation of the theory as a whole and also of its separate elements. The common element in these interpretations, however, was that all recognized the exceptional role of the theory of relativity in twentieth-century science, and its great importance for the philosophy of dialectical materialism. One should also note the series of articles by Soviet scientists (physicists, mathematicians, and philosophers) devoted to a special analysis of all the basic problems of the theory of relativity, published as a collection by the Institute of Philosophy of the U.S.S.R. Academy of Sciences in 1959. All these articles set an exceptionally high value on the achievements of the theory of relativity.[9] Of course, this does not preclude criticism of certain propositions and conclusions of the theory—for example, the invalid extrapolation from the concept that space is finite to the entire infinite universe—not that such an extrapolation changes in general the high scientific evaluation of the theory. Thus all the affirmations by Frank and certain other bourgeois philosophers who allege the denial of the theory of relativity in the Soviet Union are false and tendentious, and have nothing to do with reality.

In conclusion, let us comment briefly on the question of Frank's

* See "Philosophy and the Natural Sciences in the USSR," *Dædalus*, Summer 1960, pp. 632-647, for a report of this conference.—Ed.

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attitude to religion, which occupies considerable space in some of his works. In the book under present discussion he speaks unambiguously of the importance of religion in explaining the universe, and in understanding its ultimate structure (p. 18). He emphasizes that scientists not infrequently combine a rigorously scientific view with a belief in the supernatural. We think it important to note that Frank preaches a rather refined form of religion, which in modern religion is a widespread and characteristic tendency—that of reconciling scientific and religious truths. In other words, Frank is an adherent and a preacher of the so-called "cosmic religion," to which he attempts to give even a mathematical form! Frank sees the essence of this religion as belief in a cosmic mind whose laws govern the entire world. He develops these ideas with particular clarity in his book, *Wahrheit—relativ oder absolut?* He first declares that in accordance with such ideas "the world was created by some spirit." Moreover, it appears that "the divine laws of nature" are simple and elegant and therefore they are embodied in simple and elegant mathematical formulas.[10] These views make for a "cosmic religiousness," which is founded "on the existence of simple mathematical laws." Inasmuch as these laws are studied in physics by means of the latest mathematical apparatus, it follows that "modern physics may be examined from the standpoint of religion." Finally, it appears that the net result of such an argument is the following significant conclusion: "The general principle of science tells us how God runs the world and, therefore, every progress in science is an advance in our knowledge of God's regime."[11] It is not surprising, therefore, that Frank even attempts to put Einstein side by side with St. Augustine: the first regards time as being inseparable from matter; the latter could not envisage time as separate from the idea of God. This is what the two men have "in common," as it were.

All these arguments, of course, are artificial and tendentious. Frank *a priori* labels the objective laws and regularity of nature as "divine" and altogether arbitrarily assigns mathematical wisdom to "the divine mind." On what basis? Where is there even the slightest proof of "the mind of the universe"? On the contrary, science has at its command convincing proofs that consciousness and—in its highest degree—mind are merely attributes of highly organized matter, the brain, which in turn is an attribute of highly organized living entities. No kind of "mind" nor any kind of "spirit" is in the movement of the celestial bodies of the universe, which takes its

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course in accordance with the objective material laws that express the internal properties and substance of material bodies themselves. The objective laws and the regularity in the movements of material bodies in the universe have nothing in common with the theological discussions of Frank and all the preachers of the so-called "cosmic" or "natural" religion. All the foregoing repeatedly points up the exceptional importance of V. I. Lenin's warning that contemporary fideism will go on ever more ingeniously being a parasite on science, falsifying and distorting its achievements and results so as to satisfy the religious view of the world.

Philipp Frank's book, *The Philosophy of Science* (here published in Russian translation) is a typical document of contemporary positivism. It gives a fairly full exposition of the positivistic concepts of the problems of the philosophy of the natural sciences. With great clarity and definitiveness it presents the basic traits of modern positivistic philosophy, with all its peculiarities, contradictions, scientific invalidity, and its subservience to fideism. For this reason, to familiarize ourselves with Frank's book will permit our scientific community to carry on a consistent struggle, armed with arguments, against the various idealistic currents of modern bourgeois philosophy, thus fulfilling the great tasks designated by Lenin.

References

1. Philipp Frank, "The Present Role of Science," *Atti del XII Congresso Internazionale di Filosofia* (Firenze, 1958), vol. 1, p. 5.
2. *Ibid.*, p. 8.
3. *Ibid.*, p. 16.
4. D. Gil'bert, *Osnovaniya Geometrii* (Moscow-Leningrad, 1948), p. 56. (David Hilbert, *The Foundations of Geometry*. Chicago: Open Court Publishing Company; 1st edn. 1902.)
5. S. I. Vavilov, *Eksperimental'nye Osnovy Teorii Otnositel'nosti* (Experimental Foundations of the Theory of Relativity). Moscow-Leningrad, 1928.
6. The following works are particularly important for the clarification of this problem: Albert Einstein, *Sushchnost' Teorii Otnositel'nosti* (The Nature of the Theory of Relativity), 1955; and V. A. Fok, *Teoriya Prostranstva, Vremeni i Tyagoteniya* (The Theory of Space, Time, and Gravitation), 1955. In our opinion the latter work develops the profound thought that the *hypothesis of infinite space is closely linked with the entire complex*

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of ideas in the theory of relativity. Frank simply passes over that entire issue, a fact that does not speak for his scientific objectivity.

7. Frank, "The Present Role of Science," *op. cit.*, p. 9.

8. *Voprosy Filosofii* (Questions of Philosophy), 1955, no. 1, pp. 134-135.

9. *Filosofskiye Voprosy Sovremennoi Fiziki* (Philosophical Questions of Modern Physics). Moscow: The U.S.S.R. Academy of Sciences Press, 1959. Articles by A. D. Aleksandrov, M. F. Shirokov, Kh. M. Fataliyev, G. A. Kursanov, and the Bulgarian philosopher, A. P. Polikarov.

10. Frank, *Wahrheit—relativ oder absolut?* (Zurich: Pan-Verlag, 1952), p. 100 (English edn., *Relativity, A Richer Truth.* Foreword by A. Einstein. Boston: Beacon Press, 1950).

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